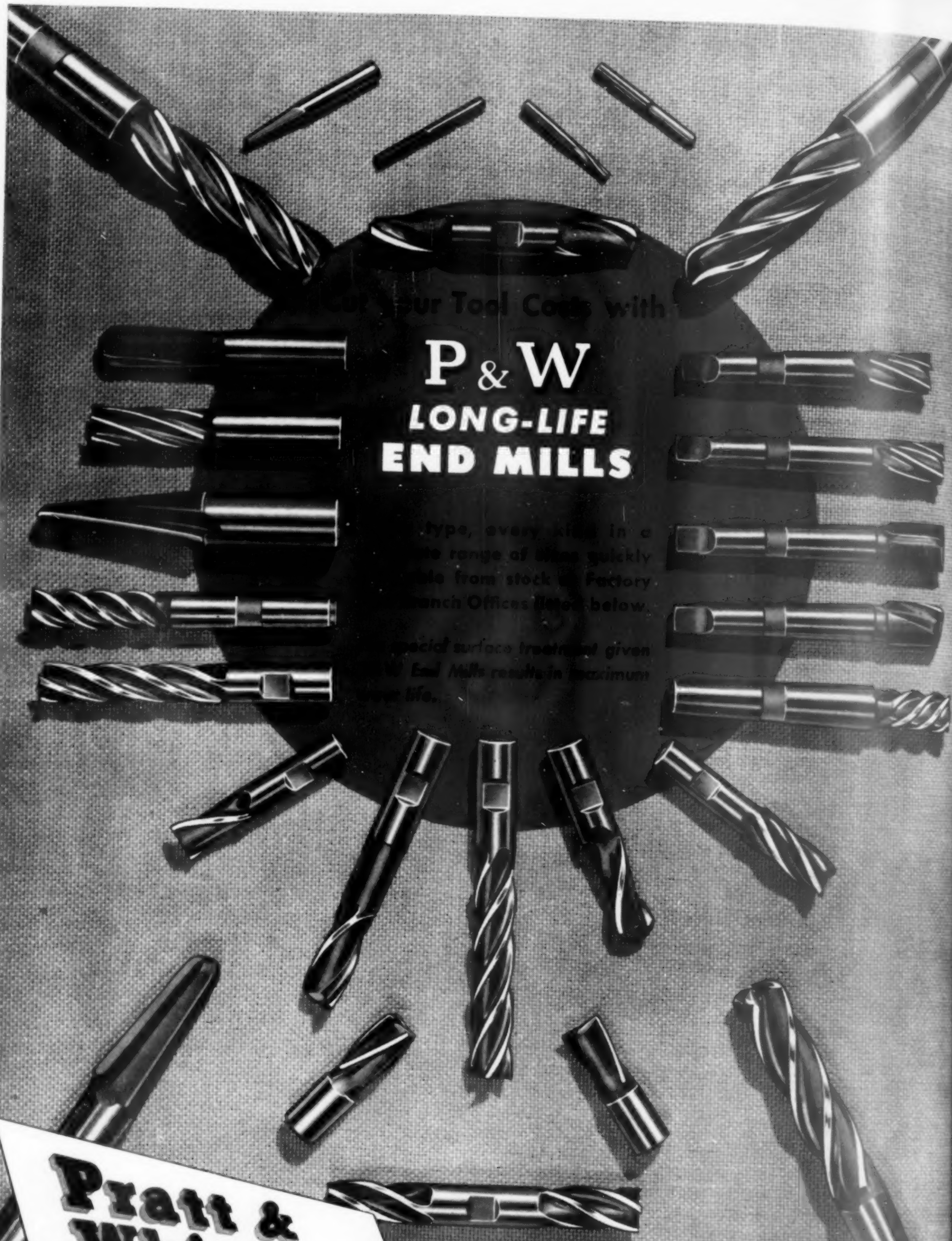
Vol. XXIV, No. 5 · MAY, 1950

THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

Departments

Behind every manufactured product is the tool engineer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ol. XXIV No. 5

Ideas—A Professional Must

ONE OF THE most impressive examples of ASTE's services to science and industry lies in the mammoth Industrial (Cost-Cutting) Exposition just completed at Philadelphia.

Made possible by the combined efforts of ASTE's members and friends, the Exposition represented a major contribution to tool engineering. More than 330 companies exhibited over 1500 various products and processes, and thousands of tool engineers heard 20-odd speakers explain new production techniques.

The Exposition was a furthering of one of ASTE's fundamental aims—the interchange of ideas. It focused on a national scale what chapter meetings, *The Tool Engineer* and other Society activities carry out monthly. For the interchange of technical information is a prime educational effort that not only benefits every ASTE member, but must be continually helped by every ASTE member.

ASTE's efforts in this direction were recognized by the thousands of members and guests who participated in our Exposition. They helped to make ASTE an even more effective educational force in the future, and aided tremendously in achieving more wide-spread recognition for tool engineering.

As tool engineering is increasingly recognized as a highly important profession, the individual tool engineer benefits accordingly. Increased prestige on a national scale brings greater prestige in industry, and consequently in the plant. The tool engineer thus finds wider recognition of his abilities. He finds a larger market for his services, and plays a more important role in the production picture.

The tool engineers who work to build stronger ASTE services—chapter and national meetings, and Society publications—are contributing significantly to their profession, and to these men we pay tribute.

H. L. Tigges

President 1950-51

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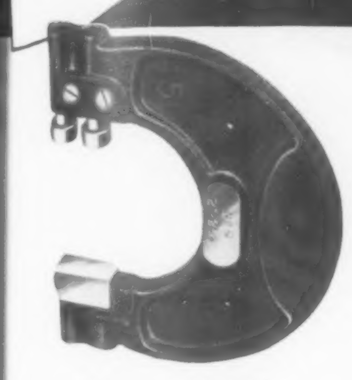

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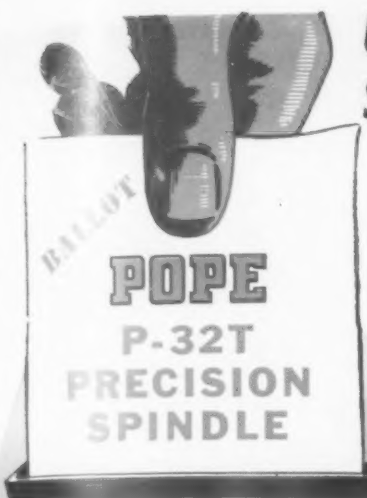

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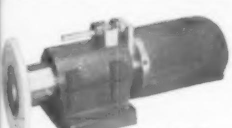

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Wheel Holder P-551 or P-555 for wheels with 1¼" holes and widths up to ¾".

P-442

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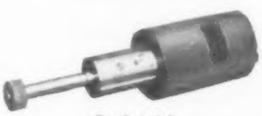
P-5101

2¾" dia. barrel 16" long and 4" dia. barrel 3" long, 1" dia. spindle nose tapered 3" per foot. Wheel Holder P-567 for wheels with 1¼" dia. holes, widths up to 1".

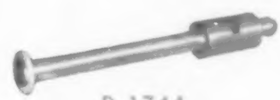


P-2641

3" dia. barrel 5" long, 1¼" dia. straight spindle extension ½" long. 1" maximum dia. Jarno tapered hole with 7/16 - 14 R.H. tapped hole at bottom for standard interchangeable extension arbors or collet chucks.

P-1723

3" dia. barrel 6" long with flange for endwise adjustment screw. ½" dia. straight spindle extension with collars and nut for wheels with ½" dia. holes and for widths up to ½".



P-1744

3½" dia. barrel 30" long and a 3½" dia. extension 4" long at opposite end of motor. 1" diameter spindle nose tapered 3" per foot.

Wheel Holder P-555 for wheels with 1¼" holes and for widths up to ¾".

P-640

3" dia. barrel 12⅛" long, 1¼" dia. straight shaft 5" long reduced to ⅝" dia., 1⅛" long. Wheel collar and wheel retaining screw for wheels with ⅝" dia. holes and widths from 1" to 1¼".

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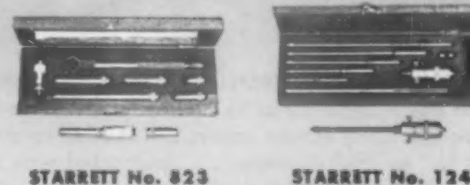

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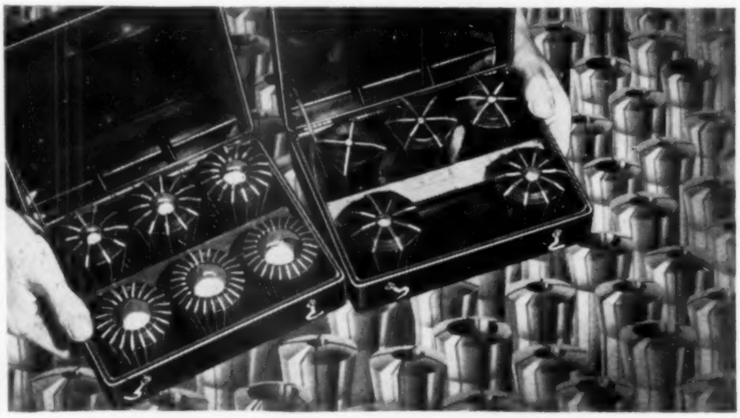
Developing the tightest, most accurate grip ever devised in lathe collet equipment, Jacobs' new Spindle Nose Lathe Chuck delivers from two to four times more torque than split steel collet chucks.

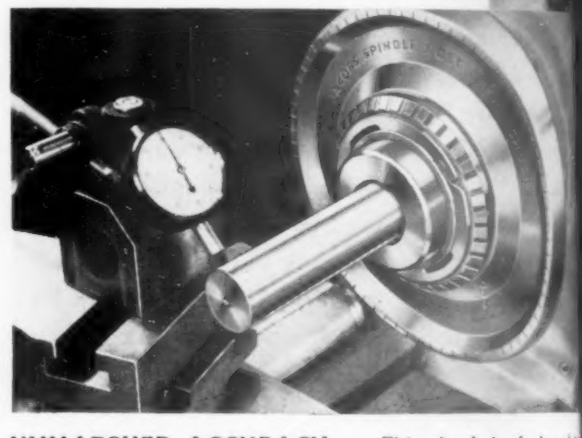
Work cannot slip under the heaviest cuts of the most modern tool room lathes. Despite this ruggedness, the unique design of the collets allows the softest, most fragile materials to be chucked without marring or scratching.

A big order? Certainly . . . but it's filled perfectly by this remarkable new chuck with its unique Rubber-Flex Collet. Multiple alloy steel jaws, hardened and ground, are bonded and mechanically locked together by Hycar synthetic rubber which will not set and is unaffected by heat, coolants or cutting oils. The collet's extra long steel jaws are always parallel to the work and the gripping load is thus distributed over the entire bearing surface. Result: accuracy and gripping power never before obtained in lathe collet chucks.

See your Jacobs distributor for bulletin 49-LC describing this new Lathe Collet Chuck.

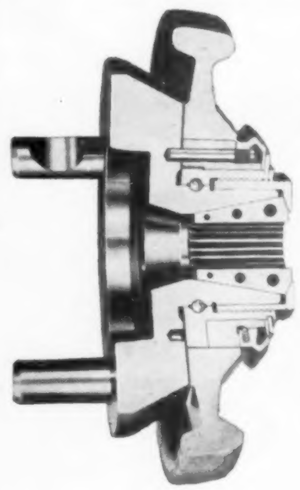


SO FEW DO SO MUCH . . . Each Jacobs Rubber-Flex Collet has a capacity of 1/8". Its grip is constant throughout this range. Only eleven collets are needed to chuck any bar from 1/16" to 1 3/8" diameter . . . contrasted with the 88 split steel collets needed to equal this chucking capacity by 1/64ths!



UNMATCHED ACCURACY . . . This chuck is designed to allow an unusual control of runout — it is the most accurate lathe collet chuck in the world today. The body is made from a single alloy steel forging. All bearing surfaces of the chuck and collets are of alloy steel, hardened and ground.

UNIFORM GRIPPING PRESSURE . . . permits the chuck to hold thin-walled tubes, plastics, wood and other fragile materials with no danger of marring or scoring. Grip is so evenly applied around circumference of work, no denting is possible.



RUGGED CONSTRUCTION

All parts except solid aluminum hand-wheel are of hardened and ground alloy steel. Compact design saves 1½" of overhang compared with other chucks. Impact tightening mechanism opens and closes chuck with great ease.

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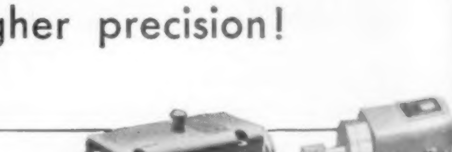
for better accuracy — higher precision!

Accuracy-destroying heat has been left out in the cold. Not only in the design of the new Heald Red-Head boringheads and wheelheads, but in every other element of the Heald machines as well.

That, in part, is Heald's answer to today's urgent need for higher precision, greater accuracy, and faster, lower-cost production.

Remember — when it comes to precision finishing, it pays to come to Heald.



Heald Red-Head boringheads and wheelheads run 50% cooler than oil-lubricated heads. What's more, they're lubricated for life — with the right amount of the right lubricant permanently sealed in. And the extra-rigid spindles are mounted in super-precision bearings protected by labyrinth seals. These Heald features mean longer, smooth-running operation — less maintenance — higher accuracy and precision for your grinding and borizing jobs.

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Hot Spot Machining

By Sam Tour
SAM TOUR & CO., INC.

PART I

THERE IS A distinction between *hot spot machining* and *hot machining*. In hot spot machining, the whole piece is not heated. Only a spot ahead of the tool is heated and this spot is machined away as fast as it is heated.

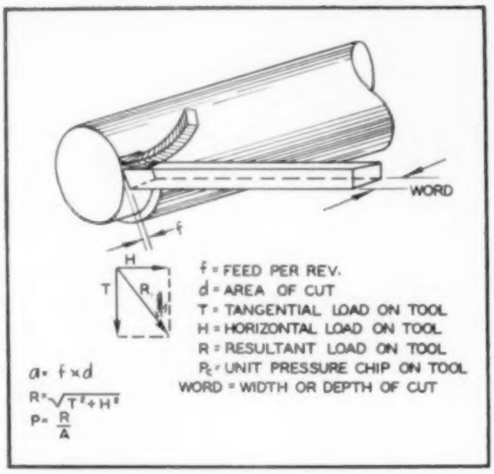
To explain hot spot machining it is necessary to start with the basic concepts of machining. A good presentation will be found in the chapter on metal cutting—lathe cutting particularly—in the Tool Engineers Handbook. In that chapter will be found many mathematical equations. In the following an attempt will be made to explain what happens in a less mathematical way.

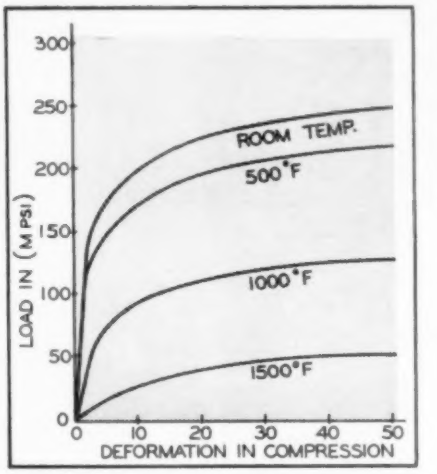
Fig. 1 shows an end-cutting tool. Although most lathe work is done with a side-cutting tool, fundamentally the mechanics are the same in either form of tool. The illustration shows the tool and the chip being removed. The different components which consume the power used in machining can be stated in mathematical terms or can be described in simple words. There are three components. Number 1 is the shear component. As the tool pushes against the work, it shears the steel. The amount of energy consumed in shearing the steel is a direct function of the shear strength of the steel. The Number 2 component is the energy consumed in deforming the chip as it leaves the edge of the work. The amount of energy consumed in this deformation is an inverse function of the plasticity of the steel. The number 3 component is the energy consumed in friction as the chip goes across the surface of the tool. Irrespective of what the division might be, the power is consumed in three ways. Those are the only ways in which it can be consumed. It is modern practice to throw large quantities of coolant on the tool because of fear that the tool will get too hot. The coolant on the steel keeps the shear strength high and does not decrease the amount of energy consumed in shear. Cooling of the chip makes it harder to deform. The more coolant on it, the more energy is consumed in its deformation. There is some question as to whether or not any of the coolant reaches the areas of the tool in contact with the chip in order to decrease the coefficient of friction. No matter whether it does lubricate or not, the energy consumed by friction is the coefficient of friction times the load applied. The load applied has been increased by the coolant and, therefore, the energy consumed by friction has been increased. Except for cooling the tool, everything accomplished with a coolant causes the consumption of more energy. Reasoning from that standpoint entirely, instead of using more and more coolant, no coolant should be used and the work should be heated. Temperature reduces the shear strength of steel and makes it easier to deform. Both of these should reduce the load that creates friction. Having reduced all three of these, it should be possible to cut a heated piece of work with less power than an unheated piece and with much less power than if a coolant is used on it.

That was the line of reasoning submitted to the U. S. Navy. If it would increase the rate at which metal can be removed from gun forgings, shafting and shell forgings, it would be worth considerable. The Navy agreed and the work was started. With the permission of the U. S. Navy, the results obtained on a whole series of steels are being presented.

Referring again to Fig. 1, it will be seen that the energy consumed in shear and at least a portion of the energy consumed in deformation of the chip combine to make up a tangential load on the tool called T. Part of the energy of deformation of the chip and the energy due to friction of the chip across the face of the tool join to make up the horizontal load on the tool called H. Within limits, the shear energy involved as a portion of the tangential load T will be independent of the feed per revolution. In other words, as the feed is increased the proportion of the load on the tip of the tool which is accounted for by deformation of the chip will increase, although the load due to shearing of steel will remain substantially constant. These combined loads are shown as T on Fig. 1. The horizontal load on the tip of the tool which is due to both deformation of chip and friction on the face of the tool is shown as H in Fig. 1. The resultant load on the tip of the tool shown as R is calculated by the formula shown in Fig. 1. This resultant load divided by the area of the chip is shown as the unit pressure of the chip on the tool and is designated P_c on Fig. 1. The unit pressure of the chip on the tip of the tool is the most important item in connection with tool failure, and it is directly related to the temperature conditions of machining.

Fig. 2 shows idealized or schematic curves of the relationship of load on tool tip to percent deformation of the chip at different temperatures. Since the shear strength of steel decreases with temperature in much the same manner as does the steel's resistance to deformation, these schematic curves can be considered as applying to both shear and deformation and, therefore, as applying to the tangential component T shown in Fig. 1. Chip thicknesses may be of the order of twice the feed being used on a lathe, therefore, the apparent deformation of the chip due to compression will be of the order of 50 percent. The curves in Fig. 2 are indicative of the situation up to a 50 percent deformation in com-





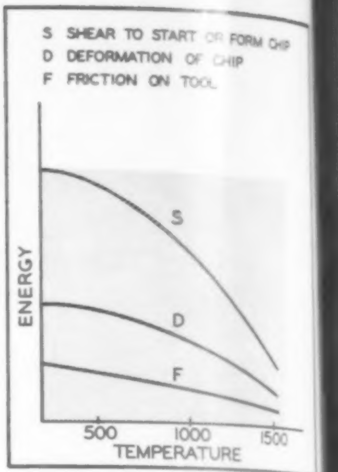


Fig. 1 (left) illustrates a design of an end cutting tool with nomenclature. Fig. 2 (center) shows idealized or schematic curves of the relationship of load on the tool tip to the percent of deformation of the chip at different temperatures. The schematic chart in Fig. 3 (right) illustrates the effect of temperature on the energy absorbed or consumed in chip formation.

pression causing a thickening of the chip to double the amount of feed. For a 50 percent deformation of chip, the load on the tip of the tool drops from a high of around 250,000 psi at room temperature for ordinary steel to a low of about 50,000 psi if the steel is heated to a temperature of about 1500 deg F. In addition, an appreciable decrease in the load on the tip of the tool due to deformation of the chip is obtained by heating to only 500 deg F, while the decrease on heating to 1000 deg F is of the order of 50 percent. Since both the shear strength of steel and the resistance of the steel to deformation are decreased by an increase in temperature, the total tangential load on the tip of a tool and, therefore, the unit pressure on the tip of the tool are decreased by the increase in temperature.

The horizontal load on the tool is due to both deformation of chip and friction, consequently the horizontal load on a tool tip will be decreased by an increase in temperature of the work. Fig. 3 is a schematic chart showing the effect of temperature on the energy absorbed or consumed in chip formation. The curve *S* is the energy absorbed in shearing the steel to start or form the chip, while curve *D* is the energy consumed in the deformation of the chip. Curve *F* is the energy consumed in friction of the chip as it travels across the surface of the tool. Friction energy is a function of both coefficient of friction and total pressure and since the total pressure comes from shear and deformation and is decreased by temperature, the energy absorbed by friction decreases with temperature also.

There is a general tendency to believe that tools fail due to temperatures developed at the cutting tips. This temperature concept of tool failures is erroneous. Tool failure is mechanical in nature. When the unit pressure of the chip on the tip of the tool exceeds the strength of the tool material, the tool fails mechanically. If the tool is of such a nature that it is softened at the temperatures generated, then its mechanical strength is decreased by this temperature and it fails mechanically. Later it will be shown that the unit pressures at the tip of a tool in cutting ordinary steel at room temperature may be as high as 750,000 psi. Such unit pressures are beyond the strength of the tool and cause mechanical failures. By heating the work it is possible to reduce these unit pressures to one-third this value, or something of the order of 250,000 psi. Under these conditions, the tip of the tool need have a strength sufficient to stand only this reduced pressure. Carbide tools make this possible.

Fig. 4 is reproduced from the paper "Milling Hot Workpieces" by A. O. Schmidt and J. R. Roubik as presented at the Semi-Annual Meeting of the American Society of Tool Engineers on October 28, 1949. (See *The Tool Engineer* for October, 1949.) This figure shows the effect of temperature upon the hardness of tool material. With ordinary tool steel, a tool tip temperature of a few hundred degrees will begin to soften the tool and, therefore, promote its mechanical failure at an early stage. In the case of high speed steel, a tool tip temperature of about 1100 deg F is necessary before softening occurs. With carbide tools (top curve on Fig. 4) the high hardness, superior to that of high speed steel or cast alloy, is maintained at temperatures up to at least 1800 deg F. A working temperature high enough to decrease unit loads on tool tips is possible with carbide tools with no softening of the material. With carbide materials having mechanical strength in compression of over 400,000 psi at temperatures as high as 1800 deg F and with the ability to reduce the unit pressures on tool tips to below this figure by heating the work, it is evident that mechanical failure due to overloading of the tool tip itself will not develop in hot spot machining.

These general ideas as illustrated in Figs. 1 to 4 inclusive were the basic ideas upon which hot spot machining was developed. It developed that Sam Tour & Co., Inc. were not the originators of this idea nor the first in the field.

A search of the patent and technical literature indicated that hot machining is not new. Of the work done, the most pertinent was by Krupp in Germany where steel had been machined while hot, using carbide cutting tools. The reference quoted is[1]: ". . . . Experiments have been carried out in planing steel billets at 1000 deg C (1832 deg F) to take

[1] "The German Hard Metal Industry," by G. J. Trapp and others. British Intelligence Objective Sub-Committee, final report 1385, item 21, p. 55.

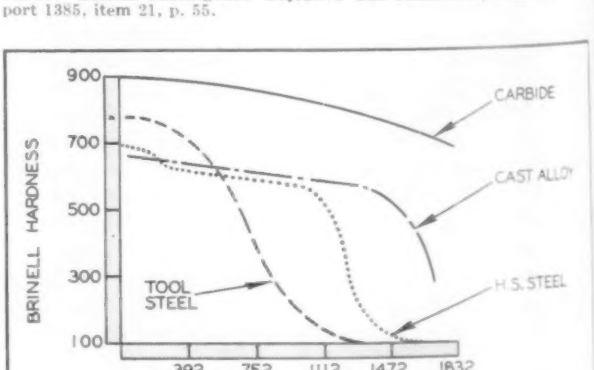
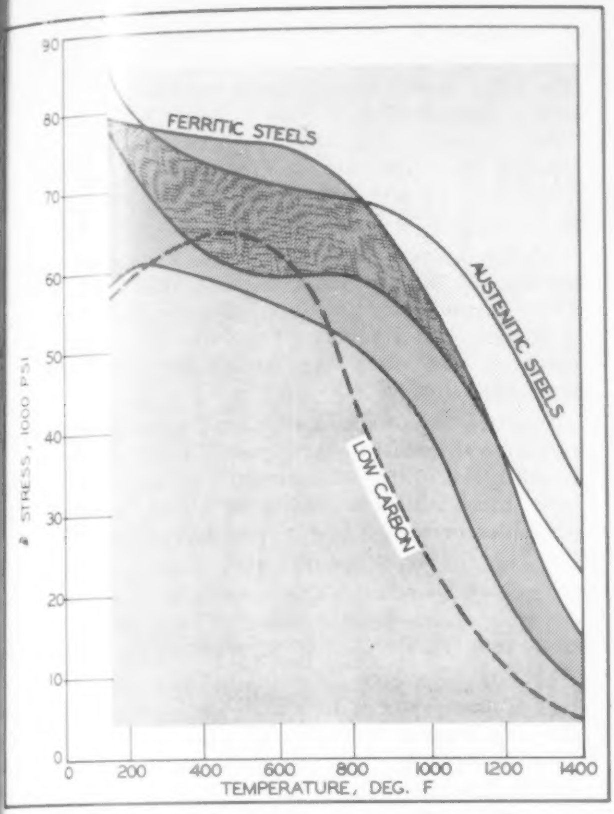


Fig. 4. Effect of temperature on the hardness of the tool material



AUSTENITIC STEELS

18 Cr-8 Ni
18 Cr-8 Ni— Ti
18 Cr-8 Ni— Cb

FERRITIC STEELS

C - ½ Mo	3 Cr - ½ Mo - 1¼ Si
C - 1 Mo	3 Cr - 1 Mo
1¼ Cr - ½ Mo	5 Cr - ½ Mo
1¾ Cr - ¾ Mo - ¾ Si	5 Cr - ½ Mo -1½ Si
2 Cr - ½ Mo	5 Cr - ½ Mo - Ti
2 Cr - ½ Mo - 1¼ Si	5 Cr - ½ Mo - Cb
2¼ Cr - 1 Mo	8 Cr - 1 Mo
2½ Cr - ½ Mo - ¾ Si	17 Cr

Fig. 5. Effect of temperature on tensile strength of low carbon, ferritic and austenitic creep-resistant steels. Reduced tensile strength at high temperatures led to the investigations of machinability of elevated temperatures.

advantage of the softening effect of high temperature on the work. A special composition (for tungsten carbide cutting tool tips) was used, containing 0.4 percent titanium carbide, 14 to 15 percent cobalt, and the balance tungsten carbide. An example was the planing of a 100-ton molybdenum case-hardening steel slab at a temperature of 800 deg C (1472 deg F) at a speed of 72 sfpm, depth of cut 0.32 to 0.39 in., and width of cut 2.76 in. A chip from this test was about $^5/_{16}$ in. thick and $2^3/_4$ in. wide. Krupp are building a special machine for hot planing, arranged so that the billet or plate can come straight from the furnace on to the machine."

The patent literature shows that attempts had been made to heat the steel ahead of the tool by direct resistance heating using the tool as one electrode and a contact on the work above or ahead of the tool as the other electrode. Apparently this procedure had never proved practical.

Concurrent with these investigations were the unrelated hot milling investigations by A. O. Schmidt, Kearney & Trecker Corp., Milwaukee.[2] Investigations at Sam Tour & Co., Inc., reported upon in the present article were based on lathe turning operations. Other investigations, in connection with drilling, milling and shaping of metals at elevated temperatures have been made, but are not included in this description.

[2] "Hot Milling—Milling High Strength Alloys at Elevated Temperatures," by A. O. Schmidt, The Iron Age, Apr. 28, 1949, Vol. 163, No. 17, p. 66.

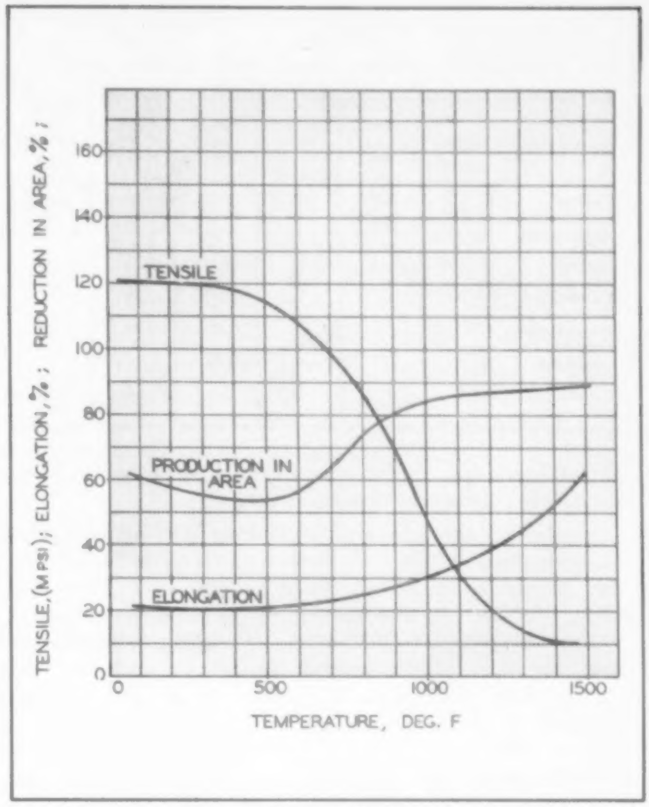


Fig. 6. Tensile properties at elevated temperatures of the "V" grade nickel steel.

After research and development work was started a patent covering the use of induction heating for the specific purpose of hot machining was found to have been issued in December, 1946. This patent was reissued in 1949, assigned to Induction Machining, Inc., Long Island City, N.Y. This company is the exclusive licensee under another patent issued in this field, and owns a number of patent applications now pending in the U. S. Patent Office.

The influence of temperature on the tensile strengths of various steels is shown in Fig. 5, as reproduced from National Tube Co.'s Bulletin No. 26. Shear strengths decrease somewhat similarly to tensile strengths. Since an appreciable portion of the power required in machining is in shearing the work, it is evident that the load on the cutting tip of a tool should decrease as the metal temperature is raised.

The metals used for this work under the Navy contract were in the form of 3 in. diam bars, 24 in. long. Their compositions are shown in Table I.

The S-816 alloy, 3 in. bar stock in 24 in. lengths, was solution treated at 2300 deg F for 3 hr, water quenched, aged at 1400 deg F for 16 hr, then air cooled; and had a hardness of 286 Bhn.

The "V" grade nickel steel was heat treated in stock lengths before cutting to test lengths to insure uniformity of heat treatment and to avoid end effects. The heat treating cycle was: Normalize at 1650 deg F for 3 hr and air cool; reheat and hold at 1475 deg F for 3 hr and oil quench; draw immediately at 1050 deg F for 5 hr and air cool.

The tensile properties at elevated temperatures of the Grade "V" nickel steel of primary interest to the Navy and used in these tests are shown in Fig. 6.

The machine used in the tests was a Reed-Prentice, 14 in. sliding gear-head lathe. To it were rigged necessary fixtures and mountings for both induction heating and gas heating equipment, tool and machine coolant lines, strain gages and indicators, and a watt-hour meter for power consumption measurement. In preliminary examinations, it was found that in heating the work in the lathe there was longi-

TABLE I Analysis of Various Steels Used in Hot Spot Machinability Tests	Low Carbon Steel	Medium "M" Carbon Steel	Grade "AN" Steel	Grade "V" Nickel Steel	S-816, High Temperature Alloy
Carbon	0.247	0.31	0.70	0.41	0.34
Manganese	0.49	0.75	0.43	0.81	1.44
Phosphorus	0.010	0.045	0.011	0.015	....
Sulfur	0.025	0.055	0.01	0.028	....
Silicon	0.090	0.25	0.20	0.25	0.23
Nickel	....	0.25	1.64	3.39	19.74
Chromium	....	....	0.93	0.20	19.49
Tungsten	....	....	....	....	4.33
Molybdenum	....	....	1.64	0.06	4.17
Copper	....	0.35	....	....	....
Vanadium	....	....	0.02	....	....
Cobalt	....	....	....	....	42.15
Columbium	....	....	....	....	3.05
Iron	....	....	....	....	2.67

tudinal expansion, and a spring-loaded lathe tailstock was designed to take up the expansion.

In selecting the source of heating or method of heating the work ahead of the tool, there seemed to be two choices. The cheaper to install was found to be an oxy-acetylene torch. The use of flame heating, as by an acetylene torch, is complicated by the flame splash, the intensity of the light from the flame, the excessive heating of both tool and machine, and by the high cost of the oxygen and acetylene consumed in the process. High-frequency induction heating is more difficult to design, more expensive to install but allows for faster heating, better control of heating and much more economical heating in production.

Fig. 7 is a sketch of one of the fixtures used to mount induction heating coils powered from a 10 kva induction heater. The drawing shows a pancake-type coil in the Transite housing designed to prevent arcing from the coil contacting the chip. This pancake-type coil concentrated the magnetic field in the test piece in a narrow band directly under the coil.

The heating coil, mounted on the carriage independently of the slide, permitted the tool to be engaged without changing the clearance between the coil and the work.

Depending upon the amount of power supplied by the induction heating coil, the depth of cut and the speed and feed of the work, the metal at the base of the cut may be at a barely visible heat (1100 deg F), when the surface being machined is at about 1500 deg F.

For use with a 20 kva water cooled, gap-type Ecco induction heating unit, a different design of coil was required. A coil, 3¼ in. ID, made of eight turns of 3/16 in. flat copper tubing instead of four, was designed and mounted in a Transite guard. This coil was a double-pancake type instead of the single-pancake type described, and tests indicated that it would heat the surface of a 3 in. diam work piece to over 1500 deg in less than 6 sec.

At the suggestion of the Navy, a new and improved heating coil for the induction heater was built. Called the Flux Concentrator, it consisted of a primary coil of 14 turns of 5/16 in. copper tubing. The turns were closely spaced, insulated with glass tape, and water cooled with water pressure 60 to 80 psi.

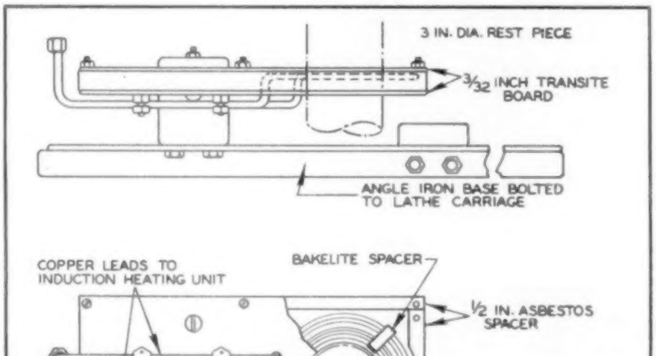
In all of the work using the gap-type high frequency generators with multiple turn coils, the coils operated at a considerable voltage with respect to the work. In using them there is the possibility of arcing. Heaviest arcing, when it occurred, was between the coil and the work.

Using a 30 kva Tocco 9000-cycle motor generator set with a stepdown transformer and suitable condensers mounted on the rear of the lathe carriage, it was possible to use a single turn low voltage coil which has no trouble with arcing.

In using gas and torches as a heat source, the torch hookup can be varied, both as to the gas used and the flame heads. A variety of flame heads were tried and several were found acceptable. The torch holding fixture is shown in Fig. 8. The curved stem Linde Air Products Co. torch was connected to a seven-tipped flame head and an adapter was made to connect this stem to a gas mixer. A shield to guard against flame splash in the direction of the tool was made of ¼ in. thick Transite, as shown. It was found later that better results could be obtained with the flames perpendicular to the work.

All of the work to date with both flame heating and high frequency induction heating indicates that as fast as the steel ahead of the tool can be heated, it can be removed by the tool. With carbide tools, temperatures of 1500 to 1600 deg F at the work surface do not result in damage to the tools although the chips may reach apparent temperatures of 1800 to 1900 deg F. The entire problem in connection with hot spot machining is the problem of introducing the heat fast enough so that the tool can remove hot metal only.

(to be concluded)



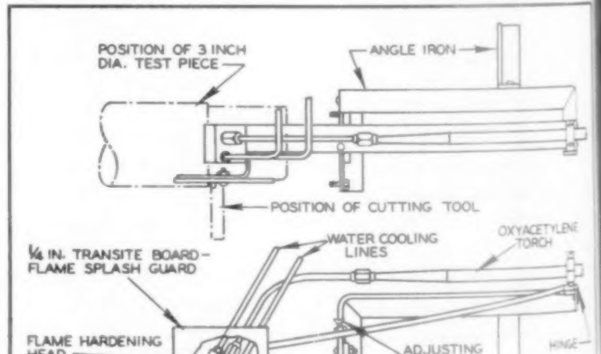


Fig. 7 (left) shows the mounting of the induction coil for heating test samples. Transite boards held with brass screws and asbestos spacers formed the upper mounting for the coil, and the assembly was bolted to the lathe carriage. Fig. 8 (right). The gas torch holding fixture arrangement shown here was mounted similarly to the induction coil fixture shown in Fig. 7. The flame tips were designed to travel with the cutting tool as it operated on the lathe.

Industrial Applications of Metamics

By W. O. Sweeny
HAYNES STELLITE DIVISION
UNION CARBIDE AND CARBON CORPORATION

Metal ceramics are a new product made by powder metallurgy techniques, and consisting of a combination of metals and ceramics. These materials have been given various names, such as ceramels, cermets, and cerametallic. Those of our company's manufacture are trade-marked "Metamic". All of the information contained in this paper is based on the work done by Linde Air Products Company and the Haynes Stellite Division, Union Carbide and Carbon Corporation, Kokomo, Indiana.

Metal-ceramics are produced by four different techniques:

1. Slip casting, which is an ancient ceramic technique wherein fine powder constituents are suspended in a water slurry or slip. The mixture is poured into a porous plaster mold from which it can later be removed, dried and fired. This is the same production process that is used to make bath tubs and toilet bowls.
2. Cold pressing, followed by firing.
3. Hot pressing, wherein the pressure and firing temperatures are produced simultaneously in a graphite die. This is the same manufacturing procedure used for hot pressing of sintered tungsten carbide.
4. Extrusion, followed by firing.

Practically all the articles we have made have been slip cast.

Most of the work which we have done on metal-ceramics, both in producing the pieces and in evaluation tests, has been carried out using a grade designed as LT-1. LT-1 is made up of chromium metal and alumina. Some limited work has been done on a grade designated as LT-2 in which the metal phase is complex and the ceramic phase is again alumina. There are many other compositions which have been prepared in the Laboratory, but the following comments will apply exclusively to Metamic LT-1.

Properties

Physical and mechanical properties are shown in Table I.

Appearance—Metamic LT-1 is dull gray or green in the as-fired condition, but when ground or machined has a typical metallic appearance.

When Metamic LT-1 fails under stress, the fracture is completely non-ductile except at extremely high temperatures or under prolonged stresses at high temperatures. However, the fracture appears finely crystalline and metallic.

Brittleness and Impact Strength

While Metamic LT-1 is strong, it is also brittle and chances are fifty-fifty an LT-1 part would break if it should be dropped, for example, on a concrete floor. Its impact strength at room temperatures is much less than metals, but about double that of pure ceramics.

Thermal Shock Sensitivity

The Properties Bulletin, which we have been using on Metamic LT-1, states that the material is thermal shock-sensitive in the sense that a small Metamic article is apt to crack if heated rapidly or unevenly. This has been a cautious approach in the belief that people who are testing Metamic LT-1 should proceed carefully. Actually, while we do not recommend it, many of the people who have tested Metamic LT-1 have heated it to a dull red and plunged it into water without cracking. Others have heated it to a temperature in the range of 2800 to 3000 deg F and have cooled it with a blast of cold air without cracking. For the most part, the shapes involved in these qualitative tests have been rather simple, and had the pieces been more complex, there is a greater likelihood they would have failed from thermal shock. We still believe that it is advisable to consider Metamic as a thermal shock-sensitive material in comparison with metals. However, when comparing it with ceramics it can be considered a thermal shock-resistant metal.

Strength

Most of the properties available on strength of Metamic are expressed in terms of bend strength (modulus of rupture) as in the ceramic industry, since, originally it was felt that Metamic specimens would be too brittle to obtain reproducible tension test results. However, recently, standard Metamic type specimens were machined and short-time tensile tests made. The values of Metamic at room and elevated temperatures on bend strength and tensile tests at elevated temperatures are shown in Tables I and II. A comparison of tensile strength of Metamic LT-1 with the best commercial high temperature alloys available is shown in Fig. 2.

Oxidation Resistance

As in the case of thermal shock sensitivity the Properties Bulletin on Metamic LT-1 has been quite conservative regarding oxidation resistance in that it has shown a figure of 2200 deg F as the top temperature at which Metamic LT-1 is resistant to excessive oxidation in air. One manufacturer has tested Metamic LT-1 at 2800 deg F for two 12-hour periods. While there was considerable surface oxidation, it was not enough to cause deterioration of the part structurally.

Another manufacturer has subjected Metamic LT-1 to 3000 deg F gas temperature for a period of ½ hour. In this case it was estimated that the temperature of the specimen was only 2400 deg F, but there was no evidence of surface oxidation. We believe the method for determining whether Metamic LT-1 is suitable for a specific application is to test it under actual operating conditions and for a sufficient period of time to establish its oxidation resistance for the specific service conditions

Resistance to Molten Metals

Metamic LT-1 has been successfully submerged in molten carbon and stainless steels, molten brass and bronze and various nickel bronzes. In all of these cases it successfully withstood the corrosion except when oxygen was injected into the molten steel. Apparently, it is rapidly attacked by the superheated iron oxide vapor. Also, it is rapidly attacked by certain molten glasses and alkaline vapors at high temperatures, and preliminary tests indicate that it is not satisfactory for molten aluminum.

Thermal Conductivity and Electrical Resistivity

The thermal conductivity of Metamic LT-1, as shown in Table 1, is comparable with cast iron and is three to four times better than the highly alloyed high temperature metals. This property makes it particularly attractive for quick thermocouple readings and also accounts in part for its thermal shock resistance. The electrical resistivity is 87 microhm per cm at 70 deg F, which is somewhat less than the highly alloyed metals.

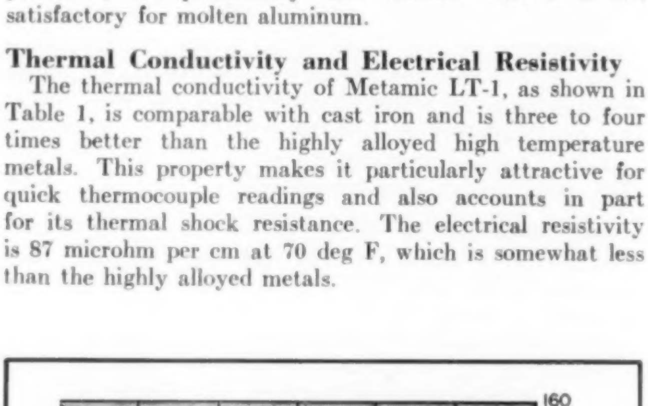


Fig. 1. Typical microstructure of Metamic LT-1.

Size and Shape Limitations

At present there are no production facilities for mak Metamic parts nor is there any real manufacturing perience in producing intricate shapes or large quantities simple shapes. These factors are responsible for the mea amount of information and knowledge we have of material and make the limitations for it more narrow might be expected when production facilities and ma facturing experience are obtained. The information ga to date has been from parts made on a laboratory A pilot plant is now being set up to continue the deve ment work.

Certain restrictions are imposed because Metamic met ceramics cannot be worked by metal-processing operati such as rolling, forging and drawing as conventionally und stood. Also, a certain amount of warpage is inherent the Metamic production process. Extended fabricati methods will ease these restrictions in the future, but c rently, the following represents the limit of what may expected in a Metamic article.

Maximum sizes

With present equipment, pieces up to 2-inches diam 18-in. long can be produced, or 3-in. diam. x 3-in. long.

Long-thin articles

It is desirable to stay below a length-to-diameter ra of 30 for rods and tubes, and under a length-to-thickne ratio of 30 for flat, plate-like articles, for example:

Rod: 0.1 in. OD x 3 in. long
Rod: 0.6 in. OD x 18 in. long
Tube: 0.5 in. OD x 0.25 in. ID x 15 in. long

In the case of thin-wall tubes it is desirable to stay und a diameter-to-wall thickness ratio of 8, such as:

Sleeve: 3 in. OD x 3 in. long x ⅜ in. wall
Tube: 1 in. OD x 12 in. long x ⅛ in. wall

Regardless of other dimensions, it is at present diffic to produce articles having a wall thickness under $1/16$ in.

Complex shapes

It is possible to produce very intricate shapes by the of cores and multi-piece molds. However, the usual should be taken to avoid sharp corners without fillets in a flange. In some cases, complex shapes are produ by machining soft pre-fired blanks, followed by finish-fir to achieve final hardness and strength.

Distortion

Camber in as-produced straight pieces sometimes amou to $1/16$ in. in a length of 8 in., or $3/16$ in. in a length of in. In the case of circular sections, the as-produced pi may be oval in cross section to the extent of the min diameter being less than the major diameter by 5 perce On plane surfaces, warpage or curling to the extent of in. in 3 inches is to be expected at present. Closer tol ances may be handled by producing the parts slightly ov size and finish grinding or machining.

Uniform Wall Sections

The inside diameter of tubes must usually be produced coring, and a taper of 0.002 in. (on the diameter) per of length must be allowed for core withdrawal. Also, it not always possible to insure that cores are precisely ce tered. Where an application requires unusual precision those respects, the matter should be brought to the ma facturer's attention.

Tolerances

Metamic articles are produced with a nominal accura of plus or minus 2 percent on the principal linear dim sions, except where this accuracy is obviated by the li tations given above regarding warpage and slightly n uniform wall thicknesses. Where a large number of ident pieces are to be produced, closer tolerances can be held

Specifications on Purchase Orders

The best way to handle the above unavoidable deviations from geometric trueness is usually to describe in some detail the application requirements. For example:

"The Metamic thermocouple tube must slide through a 0.500 in. ID hole, 11 in. long; and thermocouple beads 0.370 in. OD x 1.25 in. long must slide to the bottom of the Metamic tube."

A dimensioned sketch of the pertinent surroundings of the proposed application is always helpful in obtaining the lowest possible cost quotations.

It should also be borne in mind that Metamic can be readily machined or ground so stock should be specified for surfaces requiring close dimensional tolerances.

Joining

Although techniques have not been developed for fusion welding Metamic metal-ceramic articles to themselves or to metals or alloys, a number of joining techniques are available:

1. Mechanical threaded joints.
2. Metamic bolts and screws can be made on special order. These are, however, relatively brittle and therefore unsuited to shock loading or stress concentrations.
3. Metamic can readily be pressure-welded to Metamic by standard oxy-acetylene techniques or with high frequency induction heating. As in the pressure welding of steel, a slight "upsetting" of the joint is desirable. Jigging for pressure welding must be done more carefully than for steel articles in order to avoid excessive stress concentration since Metamic is non-ductile. However, small, simple pieces can often be pressure-welded in a bench vise with a hand welding blowpipe.
4. Shrink fitted joints can be designed for fairly heavy stresses.
5. Metamic can be copper-brazed to steel by conventional hydrogen-furnace procedures. Metamic is not readily wetted by silver solder.
6. Complex shapes can in some cases be produced by joining subassemblies during the original Metamic fabrication process in the factory.

Machining

Metamic LT-1 can be machined readily with tungsten carbide tools, or where tungsten carbide tools are not available, high speed steel tools may be used by reducing speeds, feeds, and depths of cut.

Facing, turning, and boring Metamic LT-1, using tungsten carbide tools, is best accomplished at a speed of 60 to 65 sfpm and a feed of 0.004 ipr. Heavier feeds are likely to cause breakage and force the tool to dig into the work.

Threads smaller than 1/4 in. should be ground on Metamic LT-1, but larger diameters can be either ground or machined.

Holes less than 1/4 in. diameter should not be tapped, but holes of larger diameters can be either ground or machined. Center drilling is readily performed by standard procedures.

Milling Metamic LT-1 with high speed steel cutters has been best accomplished at a speed of 50 sfpm and a 1/2 in. feed per minute. At present, there are no milling data available based on milling this material with tungsten carbide cutters, but there seems no reason this cannot be successfully carried out.

Using a shaper, Metamic LT-1 can be machined with tungsten carbide tools at approximately 12 sfpm and 0.010 in. feed per stroke. With high speed steel tools, the speed and feed should be cut in half. There is a tendency on the part of this material to chip slightly at the end of each stroke.

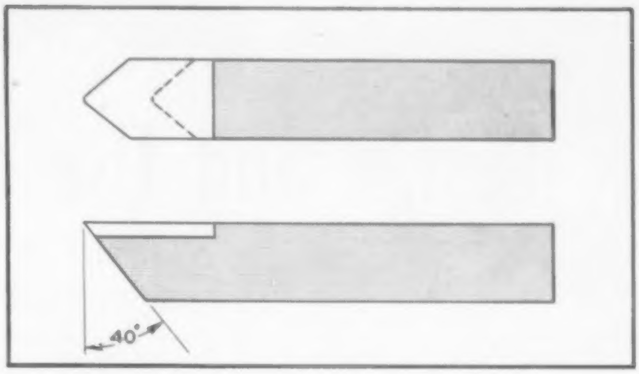


Fig. 2. Comparison of tensile strength of Metamic LT-1 and commercial high temperature alloys.

Grinding procedures to follow in grinding Metamic LT-1 are the same as those recommended for the conventional grinding of high speed steel using the soft grade, open structure vitrified bond aluminum oxide abrasive wheels. Wherever possible a coolant should be used.

Metamic LT-1 can be cut with a soft grade rubber bond, aluminum oxide abrasive cut-off wheel using a coolant. The thickness of the cut-off wheel should be held to the minimum, depending on the type of machine and the size of cut.

The type of general purpose tool we have found to work best is shown in Fig. 3. Plenty of clearance is needed for free cutting and the top face of the tool should be 90 deg with the work. Various machining operations that may be carried out on Metamic are shown in Fig. 4.

Metamic LT-1 has been tested for several industrial applications and has shown promise of strength, resistance to oxidation at elevated temperatures and of thermal shock. Thermocouple protection tubes have been tested by immersion in molten steel, cast iron, brass, bronze and other metals, except aluminum and frequently have shown up well on test, both in increased life and quicker readings because of better thermal conductivity as compared to high temperature alloys and ceramic tubes. As many as twenty immersions have been experienced without evidence of corrosion from the molten metals.

Likewise, promising results have been obtained by the insertion of Metamic tubes in molten stainless steel for bubling argon gas into the bath and into carbon steel for bubbling nitrogen. The Metamic has been able to withstand the thermal shock of going from room temperature to approximately 2800 to 3000 deg F and has been unattacked by either the molten slag or molten metal.

Flame electrodes for controls have been tested in various gaseous atmospheres and have withstood the oxidizing temperatures under these conditions in a temperature range of 2400 to 2800 deg F. These flame electrodes depend upon electrical conductivity and at the temperatures involved most metals are molten and ceramics, because of their poor electrical conductivity and thermal shock sensitivity are not suitable for this application.

Metamic has been tested in several parts of ram jets, including the Venturi-type nozzle, the flame holders and thermocouple tubes. Temperatures for these applications have been around 3000 deg F gas temperature.

Metamic is being tested for turbo-supercharger blades by the N.A.C.A. These blades are still in the process of manufacture, but the physical properties themselves look attractive enough to justify engine testing. Likewise, both production and experimental gas turbine Metamic nozzles are being fabricated. These nozzles will not only permit higher gas temperatures, but are also devoid of strategic alloying elements.

Design and Use of Die Casting Dies

By Charles M. Franklin

MASTER MECHANIC, ROCHESTER PRODUCTS DIVISION
GENERAL MOTORS CORPORATION

DIE CASTINGS PROVIDE an important tool for reducing fabrication costs to a minimum. This is due to the inherent nature of the process, which makes it possible to produce castings with holes and surfaces that require no additional machining at a cost economy beyond that of other methods. Some design and production factors include:

Reduced material cross section is possible with this method.

Uniformity of parts produced to tolerances of such close dimensions that no additional expense need be incurred to finish them.

Holes can be cast to size tolerances equal to those that are drilled, reamed or counter-bored.

Holes and contours are possible which would be excessively costly to produce by some machining operation such as broaching, profiling, turning or boring.

Surfaces require no further machining operations and are also suitable for the application of paints and lacquers.

Surfaces require a minimum of finish for plating and polishing.

And added to all of these possibilities is the low cost of producing such parts by die casting.

Perhaps seventy-five to eighty percent of the total die castings in this country are zinc base alloys, fifteen to twenty percent are aluminum base and five to eight percent are magnesium, copper base, lead and tin.

Commercial die casting has become quite a business and the greater part of the production is handled by these commercial die casters.

Many unique designs of die casting machines were the forerunners of our present-day modern die casting equipment. It was not until about 1907 that the "goose-neck" type was introduced and about 1935 the "cold-chamber" was introduced. The cold chamber is used more for the higher melting point metals.

The earlier machines, being hand operated, did not produce uniform castings; hence the introduction of air and air-operated plungers for metal displacement. At present many of the machines are actuated by complete hydraulic and electric systems so interlocked that a continuous operation of closing, shooting, holding and opening is possible.

The movable platen, actuated by hydraulic pressure, closes the die, which after a short interval is shot (or injected) with molten metal. This metal is forced into the die by hydraulically-operated plunger driven into the goose-ne which is connected to the die by means of a nozzle. Afte a suitable wait period, the dies are opened and the part automatically ejected to a point where it is either remov by the operator or drops out of the machine for furth fabrication.

Pre-Design Considerations

Die design required considerable ingenuity at times a the designer is confronted with many problems which some times must be worked out with the product engineer befor it is possible to complete the actual die design.

A die that is properly designed will, of course, opera more efficiently and the maintenance problem is very mu reduced. Good design can also reduce original die cost.

Many factors must be taken into consideration in the d design. These include size and shape of the part, co problems, production requirements, the size and type casting machine required or available. These factors p together determine the number of cavities, required and possible, in the die. Multiple cavities in some cases can designed for a die economically, and more than pay for th slight additional cost.

Designing a Typical Die

Inasmuch as the basic design of the more extensively u die casting machines are the same, the problem of die des is reduced to somewhat basic principles (Fig. 1).

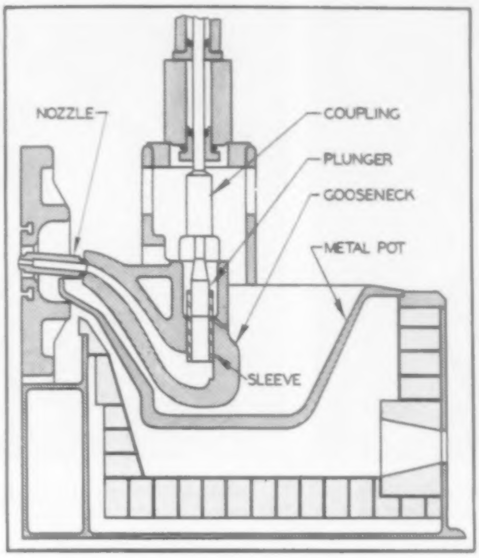
We have then a cover half and an ejector half. These usually aligned by suitable guide pins and bushings (Fig.

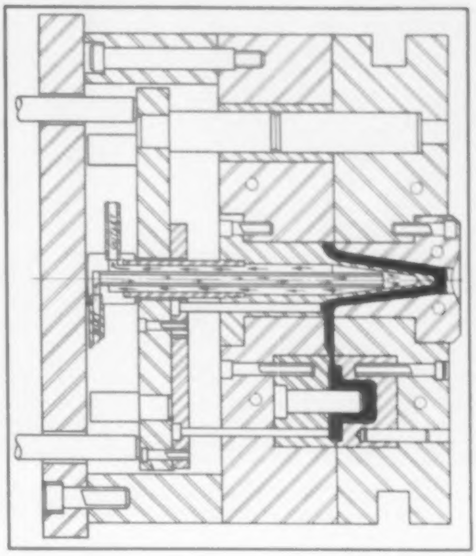
The cover half is mounted on the stationary platen of th machine and is registered to nozzle position by a suitab locator or register plate. This half also has the function carrying the metal opening or sprue.

The register plate and sprue block is usually designed such a manner that it is easily replaced in event of dama to the nozzle seat. In most cases, it is desirable to cool th sprue for operating purposes. Cooling can be accomplished this type of sprue block by welding the parts together a attaching the water and drain lines accordingly.

Fig. 1 (right). Nomenclature and fundamental parts of the die casting machine.

Fig. 2 (far right) illustrates the construction principles of the die casting die. The two halves are aligned as noted by pins and bushings; the cover half is registered to nozzle position by a locator.





In some cases, shallow cavity openings and cores are also a part of the cover half.

The ejector half is fastened to the movable platen and consists primarily of the cavity plate and ejector box, or in some cases riser blocks and ejector mechanism. The cavity usually carries the major portion of the cavity and cores. This is clamped to the movable platen by suitable bolts or bolts and clamps.

Some part designs necessitate the use of side or angle cores, which are pulled at the proper time by various types of core-pulls.

The more simple side core-pulls are operated by horns or cams and rolls which contact the core-pull in the proper sequence of die opening and closing. Core-pulls are sometimes operated by rack and pinion devices; other cases, by hydraulic cylinders, properly mounted and timed by the cycle control on the machine. The horns and cams are usually mounted to the cover half of the die, whereas the hydraulic core-pulls are generally attached to the ejector half.

Side slides, which make re-entrants or bosses that are above or below the normal surface, are necessary in some cases to produce the desired part contour (Fig. 3). The side slides are operated in essentially the same manner as side core-pulls, and often times carry core pins. The side slides may form from a small portion of one side to as much as one-half the contour, and may operate parallel to or at an angle from the parting line of the die. In some cases, it has been necessary to operate side slides and/or cores from all four sides of the die.

Generally it is desirable to lock the side slides into a fixed position due to the metal pressure build-up. This can be accomplished by locking plates mounted on the cover half and contracting the side slides when the die is in the closed position. These locking plates are designed with an angle that contacts in the last one-half inch of die closing.

Cavity design not only determines whether the use of side slides is necessary but also whether a solid die, or cavity inserts should be used.

In the design of some of the smaller parts, it is found desirable to use die inserts mounted into cavity plates or chase plates. Should an accident occur it is easier and less expensive to make new inserts for replacements. In other cases, it is more desirable to build up the inserts into a unit than to machine the insert entirely from the solid (Fig 4).

With larger parts, such as bumpers and grills, it is of

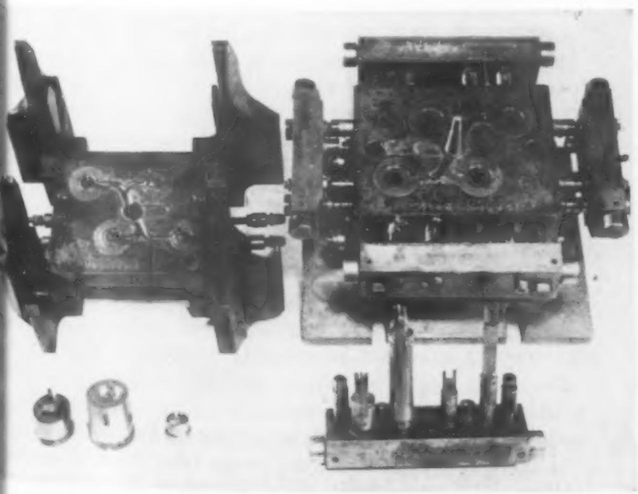
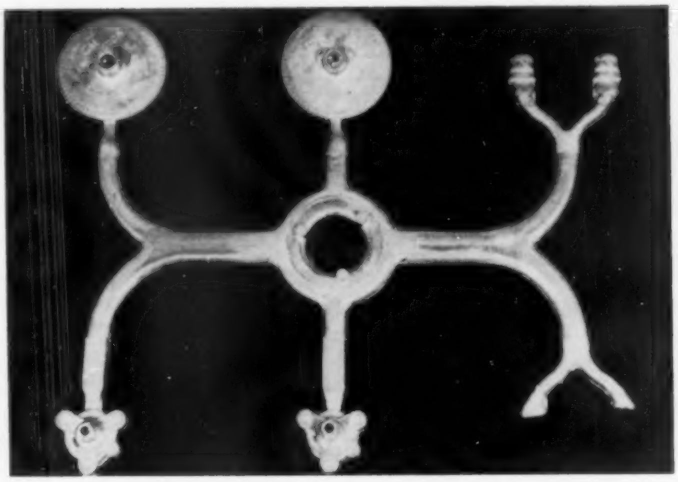


Fig. 3 (left). The use of side slides, necessary to make bosses which are above or below the normal surface, is illustrated here. Part contour affects their design and application. As shown in Fig. 4 (right), the use of die inserts depends upon part design. On smaller parts, it is cheaper to use inserts mounted into cavity plates or, as can be seen, it may be more desirable to machine the insert entirely from the solid. Choice of cavity design, whether solid die or cavity inserts, is governed by part characteristics.



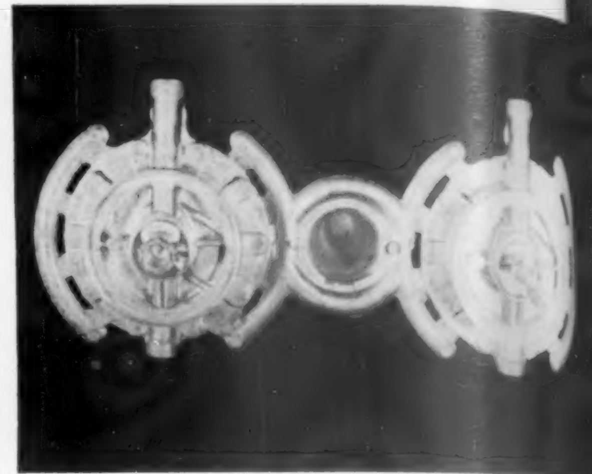


Fig. 5 (left). Runners should be as small as is possible to carry molten metal from the sprue to the gate of the casting. Fig. 6 (right). In some cases pockets are necessary to draw off a small amount of metal as well as entrapped air.

greater advantage to make the cavities from a solid piece of steel.

Alloy Castings for Dies

Recently some experiments have been made in the use of precision alloy iron castings, which require a minimum amount of finishing, such as cavity plates for zinc base die casting dies on hardware parts. These tests are not completed but may find a place in the die cast industry.

Starting at the base of the sprue, runners are cut toward the cavity or cavities and these are finally blended into the gates of the castings.

The runner should be made as small as is possible to carry the molten metal from the sprue to the gate of the casting. The cross section of the runner should be half-round, or a variation of such, so that it releases freely from the runner recess and the metal does not tend to chill through in making its way to the cavity. Avoid the use of a wide thin runner (Fig. 5).

Gates are the entrants, or openings, into the cavities from the runners and can assist many times in producing results in cavity flow that determines the soundness of a casting. This size of the runners and gates are usually determined by the size of the castings, the distance traveled, and the speed with which the cavities can be filled through the gates.

In addition to the proper gating of castings, it is sometimes necessary to provide suitable venting, to produce soundness in castings. The venting sometimes consists only of thin, wide openings that relieve the trapped air and produce a thin flash which quickly solidifies on the die surface without much metal flow.

It may be necessary to make pockets relatively close to the cavity and actually draw off a certain amount of the metal as well as trapped air (Fig. 6). This is particularly true in hardware castings where finish is required.

When considering the size of the runners, always bear in mind that the runners, while necessary, must be remelted. Runners and sprues can become a very costly re-melt factor if not watched closely.

Most castings have some kind of cores. These can vary from perfectly round cores to extremely intricate cores that are sometimes preferably built up or made of several pieces, suitably held together by some means, so that they appear as a solid unit. In some cases, it is desirable to hold the cores to very close tolerances due to part requirements, in other cases more latitude can be taken.

Subsequent fabrication costs in many cases determines coring design. I have successfully cast small holes 0.028 in. diameter by $\frac{5}{64}$ in. deep and made thousands of castings without pin breakage (Fig. 7). Also, I have cast the sixteenth diameter holes with $\frac{1}{32}$ in. taper more th $2\frac{3}{4}$ in. deep. These corings eliminated highly difficult a costly drilling operations.

Ejecting Part from the Die

In ejecting parts from the die, consideration must given as to where, as well as how, the part is to be ejecte In most cases, simple round ejector pins are used. In so cases, the bosses or projecting points of the part le themselves readily to ejection points.

The ejector pins are mounted on plates in the eject box or between the riser blocks. As the die opens, the eject pins on the machine force the plate forward, thus eject the casting.

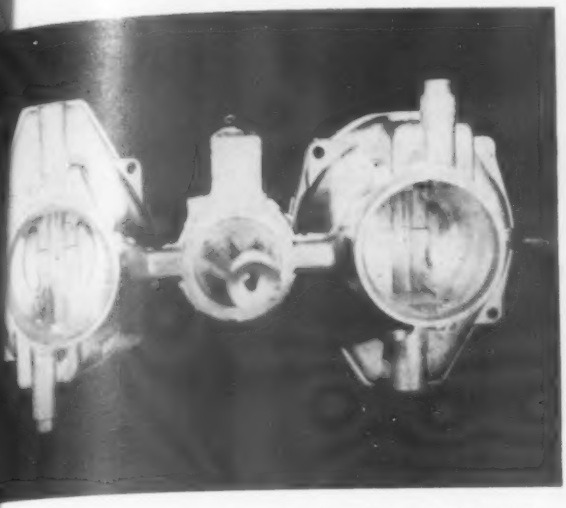
To return the ejector pins to the casting position, pu back pins, mounted in the cover half, contact mating pi on the ejector plate. The plate is thus pushed back wh closing the die to stop pins for locations.

Simple or direct ejection of the part is not always possib due to die operation interference and necessary length o ejector pins. In order to avoid manual ejection, it is possib to design this operation successfully into a mechanis operating in sequence of opening and closing of the die, th speeding up the operation and reducing the manual hazar contributing to die maintenance (Fig. 8).

Sometimes the casting shrinks to the coring or ma members on the cover half and necessitates that the castin be pulled from this section in some manner. This can be accomplished by the side slides, which can be made t hold the castings either by re-entrants in the castings or by the bosses or extended surfaces of the castings. The sid cores may also be suitable for this operation (Fig. 8). Thi can further be accomplished by using the ejector pins an ejector holes. The ejector pins being cut on the ends, with a back taper, thus holding the metal until the ejection has taken place.

Occasionally the part must be as nearly flat as a machined surface; yet due to certain bosses or extended surface re-quirements it cannot be suitably machined. This can com-plicate the ejector problem especially if there is the added problem of ejecting this part from long cores and contours requiring excessive stripping pressure (Fig. 9).

I have reference to a carburetor bowl cover which has a rather deep pump well, almost straight for approximately two and one-half inches. This, with other coring and cavity problems could not be ejected in the conventional manner and produce the mating surface requirement of flatness. A



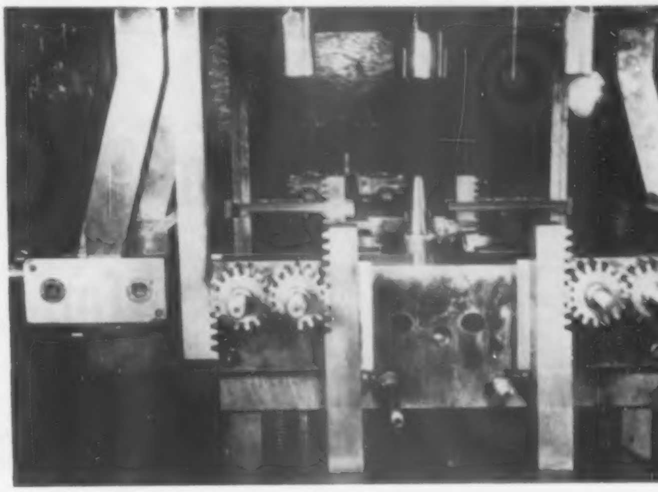


Fig. 7 (left). Successful planning of coring design is illustrated above in this casting of small holes in the part. Fig. 8 (right) shows a method of designing for casting ejection in the event that the part cannot be ejected without resorting to manual means.

...er complex ejector mechanism was required, and this resulted in making the die plate, on the ejector half, move forward about one inch; then the ejector plate was in turn moved forward to complete the ejection operation. As the die closed, the operating mechanism returned the various members to their functional positions.

Control of Flash

Flash is prevalent on all die castings. This is sometimes intentional as in the case of venting, or in the matching of cores or other parts of the die. It also results from the use of the die and must be taken into consideration in the design of the die, as many of the subsequent fabricating operations are dependent on the condition of the casting as it is produced by the casting department.

Inasmuch as flash removal problems must be taken care of, it is desirable in most cases to have approximately 0.015 in. thickness of flash for good press trimming. This is true especially where the mating surfaces of the cover and ejector halves become damaged by flash around the cavity openings. I recommend a recess 0.015 in. deep by 3/32 in. provided at this point in the cavity side of the die.

Another flash problem that is often a source of trouble in the fabrication of parts is caused by the build-up between the side slides. This can be controlled in most cases only by constant vigilance on the part of the operator. If not controlled, it will cause a lot of scrap and may cause serious damage to the die as well as loss of badly-needed production. A well-trained operator is an important factor in the die casting department, as much of the die maintenance can be controlled by a careful, conscientious operator.

In designing die casting dies, it is advisable to use the maximum taper or draft possible. This applies both to cores and cavities, since it reduces the stripping and ejection problems as well as maintenance problems.

To produce castings at the highest possible output per hour, it is necessary to cool the dies and other sections to set the metal faster. This is accomplished by water lines or chilling chambers so designed that a suitable passage of water controls the die temperature as required. These are hooked up to control valves, operated by hand, to give the desired condition.

In finishing lock parts, it has been found advisable not to attempt to broach or shave the holes to size. In taking the flash from the cored openings, the tools are made to break the flash to the cored size only. Any attempt to broach-size or shave a hole or contour results in very short life tools and distorted parts.

If a part required any additional machining, it is desirable to remove sufficient material to get under the surface of the casting.

Metal temperatures and die temperatures play an important role in the production of sound castings. This is true particularly in carburetor castings. A cold die will not fill properly, thereby causing leakers and scrap. A hot die will not set the metal fast enough and causes shrink sections which can also be leakers or scrap. Hot dies also can be responsible for slower machine cycling or reduced production.

Porosity is sometimes caused by an increase of plunger pressure but proper venting must also be given consideration.

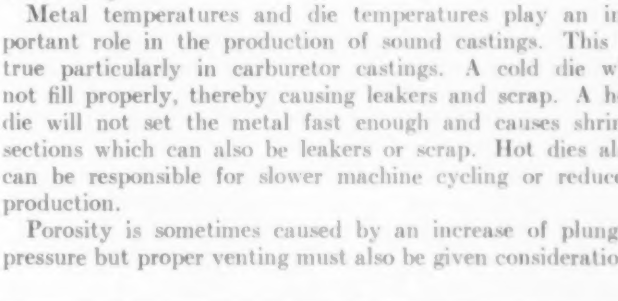


Fig. 9. In the part above, it is required that the surface be almost as flat as a machined surface, yet bosses prevented machining of the surface. A number of complications in ejecting arose, necessitating a rather intricate ejection design.

Use of Element Time Data for Effective Tool Design

By
N. M. Perris and H. K. Keever
PARTNERS
STEVENSON, JORDON & HARRISON, INC.

WHILE CONSIDERABLE ADVANCE has been made in the development of tools for insuring the accuracy of the piece, there are many opportunities for improvement and development in tool design from the viewpoint of increasing production.

To put this another way—tool designers do an admirable job of designing a tool to insure interchangeability in the design of a product, but they could do much more from the standpoint of *assisting* the machine operator to quickly and *economically fabricate* the piece.

There are two general sources for tool estimating information, neither of which is either sufficiently detailed or specific enough to enable adequate modifications in design or appraisal of the savings through increased production that would result from these modifications.

Inaccuracy of Tool Estimates

In the checking of tool estimates we usually find that they are based on either one or both of the following systems:

1. Those figures which are gleaned from the cost system in use.
2. Those facts and figures which are based on general knowledge, that is, what the tool designer thinks will be the cost and production resulting from his design.

There are noticeable weaknesses in both of these sources of information. The most pronounced defects in the information obtained from these systems include:

1. They are based on history, that is, past performance. It is difficult for anyone to remember the external conditions that affected the results. For example, no one can remember the operating conditions that prevailed in the shop three months ago. This is apparent when anyone goes back over the cost of production records when the same part has been run several times in the last year. The result can vary 50 percent from the average, and we well know that this is not caused by the tooling.
2. Practically all data are collected by a clerk in one of the office departments who is not technically minded enough to make the proper classifications in such a way that these data can be readily used by a tool designer.
3. As a correlation to 2 above, such systems are based on a paper work routine. It has been our experience that most concerns are careless in the handling of the details necessary in order to give both accurate and useful information, on costs and production. Descriptions of the work, order number, time taken, etc., are at times carelessly reported and copied. Time on one job is erroneously charged to another and so on.

Element Time Structure

To overcome these difficulties and, at the same time, to furnish both the line and the staff departments of an organization with accurate and understandable data and information—we industrial engineers adopted what we call "element time data." Our firm has been using element time data for over thirty years. It is not a recent development by any means. It was developed as a basis for methods analysis and rate setting. Its use in tool design is a by-product of the work in methods analysis.

All machine design is based on the practical application of a series of fundamental mechanical movements. Any design, whether it is a jig, fixture, part or product has as its function the guiding of some forming tool to produce a certain shape, contour, supporting section. In brief, a designer looks first to the purpose of his design and employs a series of mechanical and guiding movements to produce the final object of his design.

We do exactly the same thing with element time data. We list, classify and arrange in tables every possible movement of the machine or the hand. In fact, all element time data consist of four major classifications. They are:

1. All movements of the machine such as:
   - a. adjust to cut
   - b. Return from cut
   - c. Rapid traverse
   - d. Index
   - e. Change speed
   - f. Change feed
   - g. Position-hand-table
2. All movements of the cutting or forming tools such as
   - a. Slab mill
   - b. Face mill
   - c. End mill
   - d. Face
   - e. Turn
   - f. Drill
   - g. Bore
   - h. Ream
   - i. Tap

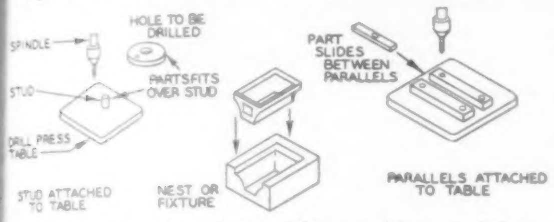
FIG. 1
STANDARD TIME DATA
HAND FEED DRILL PRESS MACHINES
HENRY-WRIGHT, ALLEN, DELTA

Description of Place and Remove and Handling Elements

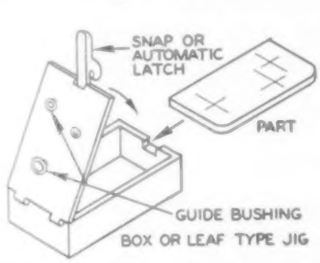
These standards cover all operations done on hand or foot feed drill presses of single or multiple spindle variety. The work is usually rested upon the table, or in a jig or fixture. The machining tables cover times for die cast, brass, bronze, cast iron, steel and malleable iron.

Place and remove includes picking up a piece from a tote pan beside the drill press table, placing and securing it in a fixture or upon the drill press table, releasing it from the fixture, removing it by a spring, blast of air, gravity or by hand and tossing or placing it in a tote pan beside the machine.

In general, place and remove falls into two basic divisions.



No. I covers the plain drill press table, parallels or a stud attached to the table, or a nest or open fixture which fits the contour of the part, or locates the part by previously machined holes or prodections.



No. II covers the use of a box or leaf type jig, which is essentially a square box having one or more locating points and a hinged cover which closes over the part and fastens with an automatic latch.

3. All movements of the hand in loading the machine such as: loading and removing the piece, locating and clamping, measuring.
4. All movements connected in assembling such as: fastening one part to another—to form a mechanism by various types of fasteners from common bolts and nuts on up to various types of welding. Similarly the fastening, and attaching of one mechanism to another.

We believe we can explain element time data by showing several examples. See Figs. 1, 2 and 3. Please note two things:

1. How these data are classified.
2. How the times for each of these elements or movements are recorded.

Advantages of Element Times

The advantages of using such element time data to assist tool designers in developing their art are as follows:

1. All data is technically classified; terminology follows the practices of designers. Anyone with mechanical perception can visualize the fabricating or assembling of the piece through the various movements covered in the element time tables.
2. These data are available in *advance* of the design. The tables or sections of them can either be furnished to tool designers or the tool design department can call on the industrial engineering staff to furnish them with the times for each of the alternates of design. From this information, a decision can be made by the designer as to which alternate is the most effective.

FIG. 2—STANDARD TIME DATA
HAND FEED DRILL PRESS MACHINES
Henry & Wright, Allen, Delta

Base Minutes Per Part — **Place and Remove**

All placing of parts done by hand. Removal of parts as described in tables.

No Fixture—Open Fixture—Nest—Parallels

Weight of Part Ounces	Type of Removal: No Grasp	Grasp and Release	Grasp and Place
1	.015	.021	.028
2	.016	.022	.030
3	.018	.023	.032
4	.019	.025	.034
5	.020	.026	.036
6	.022	.027	.038
7	.023	.029	.040
8	.025	.030	.042
9	.026	.031	.044
10	.028	.033	.046
11	.029	.034	.048
12	.031	.035	.050

For lever-type clamp, add .015 Min.
For extreme deviations from square shape, add

Ratio of length to width	Additional minutes
4:1	.002
5:1	.004
6:1	.007
7:1	.011

For restricted and positioning — add .009 Min.
For square or oblong pin, or more than (one) round pin — add .007 Min.

Fig. 3
STANDARD TIME DATA
HAND DRILL PRESS MACHINES
Henry-Wright, Allen and Delta

Base Min. to Shift Part from Hole to Hole or Spindle to Spindle and Misc. Handling

NO FIXTURE BASE MIN. PER HOLE			WITH FIXTURE BASE MIN. PER HOLE		
Weight of Part in Oz.	Move Hole To Hole	Move Spindle To Spindle	Wgt. Part and Fix. in Pounds	Move Hole To Hole	Move Spindle To Spindle
0- 2.0	.003	.009	1- 5	.006	.015
2.1- 4.0	.003	.010	5.1-10.0	.008	.016
4.1- 6.0	.004	.011	10.1-15.0	.010	.018
6.1- 8.0	.004	.012	15.1-20.0	.012	.020
8.1-10.0	.005	.013	20.1-25.0	.014	.022
10.1-12.0	.005	.014	25.1-30.0	.016	.025

Factor for turning part or fixture 90 deg. or more = 1.45

DISTANCE FACTOR FOR HOLE TO HOLE

DISTANCE (IN.)	FACTOR
0 - ½	.0
17/32 - 1½	1.0
1 17/32 - 2½	1.1

BUSHING LOOSE FIT IN JIG

Base Min. Per Hole	.032

OIL TOOL ON SPINDLE WITH BRUSH

No. of Spindles	1	2	3	4	5	6
Base Min. Per Operation	.028	.032	.035	.038	.042	.046

BLOW OUT FIXTURE WITH AIR HOSE

Base Min. Per Operation	.045

HANDLING TOTE PANS

Part Wgt. In. Oz.	Base Min.	Part Wgt. In. Oz.	Base Min.	Part Wgt. In. Oz.	Base Min.
0- 2.0	.001	10.1-14.0	.003	22.1-26.0	.006
2.1- 6.0	.002	14.1-18.0	.004	26.1-30.0	.007
6.1-10.0	.002	18.1-22.0	.005	....	...

FIG. 4—STANDARD TIME DATA

HAND DRILL PRESS MACHINES
HENRY-WRIGHT & ALLEN

Base Minutes Per Hole — Drilling Brass and Die Cast Zinc

RPM	2500	2500	2500	2500	2450	2030	1740	1520
FEED (IN.)	.005	.007	.008	.0095	.0105	.012	.0135	.015
DRILL SIZE								
Depth of Hole	57-45	44-27	26-5	4-1 A-H	I-Q	R-W	X-Z	
1/16	.005	.004	.003	.003	.002	.003	.003	.003
3/32	.008	.005	.005	.004	.004	.004	.004	.004
1/8	.010	.007	.006	.005	.005	.005	.005	.005
5/32	.013	.009	.008	.007	.006	.007	.007	.007
3/16	.015	.011	.009	.008	.007	.008	.008	.008
7/32	.018	.013	.011	.009	.008	.009	.009	.009
1/4	.020	.014	.012	.010	.010	.010	.011	.011
9/32	.023	.016	.014	.012	.011	.012	.012	.012
5/16	.025	.018	.016	.013	.012	.013	.014	.014
11/32	.028	.020	.017	.014	.013	.014	.015	.015
3/8	.030	.022	.019	.016	.014	.016	.016	.016
13/32	.033	.023	.020	.017	.016	.017	.018	.018
7/16	.035	.025	.022	.018	.017	.018	.019	.019
15/32	.038	.027	.023	.020	.018	.020	.020	.020
1/2	.040	.029	.025	.021	.019	.021	.022	.022
9/16	.045	.032	.028	.023	.022	.023	.024	.024
5/8	.050	.036	.031	.026	.024	.026	.027	.027
11/16	.055	.040	.034	.029	.026	.029	.030	.030
3/4	.060	.043	.037	.031	.029	.031	.032	.032
13/16	.070	.053	.040	.034	.031	.034	.035	.035
7/8	.075	.057	.043	.037	.034	.036	.038	.038
15/16	.080	.060	.047	.039	.036	.039	.041	.041
1	.085	.064	.050	.042	.038	.042	.043	.043
Min/Point	.002	.002	.003	.003	.004	.005	.006	.006

Tool Adjust	Min. Per Hole	Combination Drill & Countersink	
		Depth of C' sink	Additional Min. Hole
Break through holes	.009	1/32" - 1/16"	————
Blind Holes	.005	5/64" - 1/8"	————

"Minutes per Point" is to be added to all operations where the drill runs through a guide bushing and engages a flat surface. It will not be allowed where the drill starts at the bottom of a hole drilled by a larger drill, or where the hole has been spotted in the molding of the part.

"Tool Adjust" will be allowed for each hole drilled. The "Minute per Hole" value will be either for "Break Through Hole" or "Blind Hole."

3. These data are the result of some 25 years of continuous time study in a number of metal working plants. They are the result of direct observations and checking so that they are bound to be more accurate than data secured from the analysis of cost and production records.
4. What is most important is that the same data the shop use to plan their work and to determine their operating efficiencies, are available to all staff departments interested in design. Furthermore, we have absolute coordination between the operating departments and the design departments through the medium of common data and similar information.

Illustrations

The following examples selected to illustrate time element data are of simple applications. We have done this with a purpose. After all, complicated designs are nothing more than a collection of simple applications joined together for one final objective. We have also centered our discussions on simple illustrations because our element time data are classified by these simple applications of design practices.

It may seem that the time applying to each of these illustrations is very small. They are all in fractions of a minute. Do not be misled into thinking they are minor or unimportant. There are millions of such movements in a day's work in the average shop . *Their accumulative effect is great.* To put this another way, the saving of 2/10 of a minute in one movement may be 25 or 35 percent of the time of the job.

When using these time tables to determine which type of design would be best suited to a particular operation, it would be necessary to list the sequence of steps to be performed by the worker when using the tool. The corresponding time values would be looked up in the time charts and the value in time determined. By adding the time for the various steps of work together, the total time for the operation would be determined. A comparison of these times for the different designs under consideration would enable a designer to select the one most economical to the company.

This selection would have to take into consideration the cost of the proposed fixture and compare this cost with the savings resulting from the use of the tool or fixture. Production quantities have a great bearing on the advisability of making new fixtures or altering old ones.

The effect of the design on the time required to set up the tool, jig or fixture in actual operation is important. Complicated tools requiring complicated set-ups should be avoided where possible. Unless the savings in operation or piece time are great, complicated set-ups serve to further increase cost. The only advantage to be gained in high set-up time must be in the reduction of time to make the part after the set-up has been made. The size of the lot, or quantity of pieces to be run should also be considered in determining how far to go in complicating the fixture. For short run jobs, fixture and tool design requiring a minimum of set-up time must be the prime consideration.

Fundamental Principles to Be Considered

There are a number of fundamental considerations before proceeding with the examples showing the effect on shop costs and how standard times were helpful in solving the problem. Some of these include:

1. Ease of handling the part in and out of the jig or fixture.

For example, consider parts located over studs. This circumstance varies according to the accuracy required. Wherever possible, the tool designer should strive for quick and positive location. If only normal accuracy is required, the fitting of parts to studs should be suited to easy handling. In terms of actual time on one part with a bore diameter of 4.920 inches—4.921 inches, there was no need indicated on the drawing to hold close tolerances between the milled surface and the bore. The time taken to tap piece and work it back and forth over a stud took 0.21 minutes. If the stud had been made to a free and easy fit, the time would have been 0.09 minutes, a 57.3 percent difference in time.

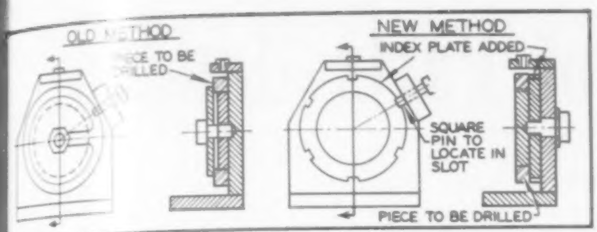
The length of the stud may also have a bearing on the time. The stud should not be longer than necessary for the accuracy needed.

2. The number of clamps or work-holding devices should be kept at a minimum consistent with the requirements for rigidity or accuracy.

In one of our client's plants we observed a radial drill fixture used to front and back-spot face a large cast iron part. The fixture was a trunnion type and provided 13 tail knobs for holding the part in place. If the worker used these 13 knobs, it would take 2.60 minutes to fasten the piece in place. It developed in actual operation that only three were necessary, requiring a time of 0.47 minutes. This represents a 55 percent saving in time which is substantial, besides, the cost of the other 10 tail knobs put on the fixture could have been saved.

3. Universal jigs for small work to be drilled can serve a real purpose in reducing tooling cost as well as requiring less storage space and cost of tool delivery to the workman.

Fig. 5



PART HELD WITH CAP SCREW AND "C" WASHER

Holes located by drilling first hole and then locating each (of 5) succeeding hole by loosening cap screw, rotate part to engage locating pin in drilled hole and tighten cap screw.

TIME—BASE MINUTES—PER PIECE

Place and remove part	.27 Min.
Drill holes 6 @ .11	.66
Index part 5 @ .17	.85
TOTAL	1.78 Min.

This uniform pattern of jigs become helpful to the drill press operators in doing their work. They should be of the quick-operating kind and can be so standardized as to require only minor additions to convert them from one job to another.

4. Standard or interchangeable bushings for all jigs are not always as economical as some people think they are.

Wrong lengths of bushings for proper chip clearance are used, and bushings are often in poor condition, thus affecting the accuracy of an otherwise good jig. In many cases, the holes are spot drilled, the bushing removed and then the hole finished, all requiring extra production time. This method has been found to be expensive and inaccurate and results in poor drilling practices, particularly where inexperienced workers are used.

5. The length of approach to cut in the case of milling fixtures.

We later show several examples of reducing the time required to cut by reducing the cutter approach.

6. Ease of cleaning.

Jigs and fixtures should be designed whenever possible to be self-cleaning. Locating surfaces may be raised and angular surfaces provided so that chips which accumulate will slide away from location points. Some fixtures may be made open so that when the piece is pushed into the fixture, the chips are pushed out.

Where Some Modification of Tools Resulted in Substantial Labor Savings in Operation

1. Drill Jig for Bearing Lock Nut

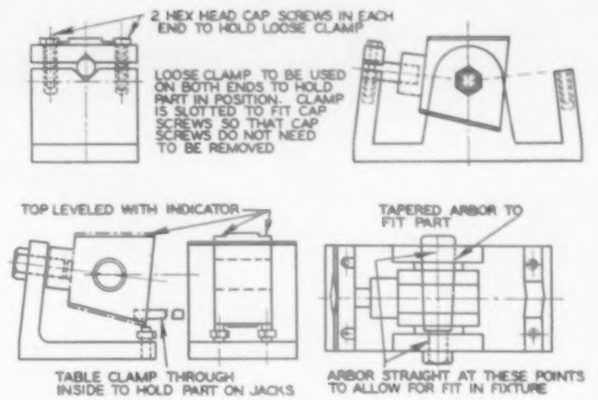
Two types of fixtures used for drilling six holes equally spaced in the periphery of a bearing lock nut are shown in Fig. 5.

The old method involved drilling one hole and then using this hole to locate the next through the use of an index pin. Parts were held in place over a stud and by a clamp using a cap screw.

In the new method, the part is held by the threads on an index plate, the threads cut undersize to allow for a slightly loose fit so that part can easily be placed and removed. Holes are located by index pin in slot in index plate.

The time required to complete the operation under the old method amounted to 1.78 minutes, under the new method, 1.19 minutes, and resulted in a saving of 33.1 percent in time.

Fig. 6.



Old Method Cost—Minutes per Piece

P. and R. 2 @ .45	.90 Min.
Level and Indicate 2 @ 6.00	12.00
Cut (1¼ in. feed) 2 @ 3.90	7.80
Total	20.70 Min.

New Method Cost—Minutes per Piece

P. and R.	.95 Min.
Reposition	.55
Cut (6 in. feed) 2 @ .815)	1.63
Total	3.13 Min.

NEW METHOD—Self Locating

fixture—requires (1) loading and (1) repositioning to straddle mill both sides.

SAVINGS—BASE MIN.

Old Method	20.17
New Method	3.13

Savings $17.57 = \frac{17.57}{20.70} = 84.8\%$

Under the old method, the threads in the hole of the part were sometimes burred due to the careless loading and unloading of the piece in the fixture, and excessive drill pressure. This necessitated the addition of a burring operation which was not required when using the new fixture. An additional 0.85 minutes, which has not been included in the above saving, was thus saved.

2. Milling Crosshead Shoe Bearing Key

Under the old method a simple fixture was used to hold the part as shown in Fig. 6. The feed used in this case was 1¼ ipm, due to the fragile or insecure method of holding the part; and even with this low feed rate a satisfactory job was not obtained. It was also difficult to get the cut equidistant from the center, making it necessary to later fasten the crosshead shoe bearings to the crosshead and finish turn as a subassembled unit.

In the new method, the part is held more securely in a self locating fixture. A feed of six inches per minute was obtained. Due to the tapered arbor for locating and holding the part from the center, the operation of finish turning the crosshead shoe bearings in the subassembled state was eliminated. This saved an additional 15 minutes beyond the 84.8 percent saving indicated in the sketch.

The Mechanization of Parts Handling

By C. E. Kraus
PRESIDENT
KRAUS DESIGN INC.

In the manufacture or production of quantities of duplicate items, progress, which means not only reduction in total cost but increase in uniformity and quality, has resulted from increased mechanization of all phases of the operations involved. The ultimate or complete mechanization, where raw material is dumped into one end of a completely automatic line and the end product is ready to ship to the consumer, is possible and practical only occasionally.

Before actually discussing any specific mechanisms, it may be well to go over some of the many factors that enter into determining the mechanisms, and those factors involved in selecting practical applications.

Economic Justification

The most important, of course, is the economies of the applications. The present method of handling workpieces, whether entirely by hand or semi-automatic, results in a certain overall cost picture. This cost picture is based upon the average operating rate, including down-time for personnel reasons, down-time due to the present equipment involved, factors such as rejects or average quality produced, cost of labor and supervision, and other overhead costs. With more complete mechanical handling of pieces, the net cost per unit piece is affected favorably by many factors. Generally, the average production rate will increase, the rejects due to throw-out mechanisms and interlocks may decrease, and the general quality of the workpiece may increase due to increased uniformity. With automatic handling, the increased production rate that is sometimes possible actually shows a decrease in the number of processing units required, and frequently a decrease in the machine investment that is necessary. Balanced against these benefits is a certain reduction of versatility, which may be an important factor if a variety of pieces are to be handled or if design changes are frequent or extreme.

Maintenance of any sort of equipment is always a factor, and automatic equipment is no exception. It is customary to assume operating efficiency figures of from 70 to 80 percent on an average, for machines which are loaded and unloaded manually. These machines will not show 100 percent efficiency by the simple expedient of making the loading and unloading automatic.

The first step in analyzing any handling application is to study the nature of the workpiece itself. The ideal workpiece is stable in shape, uniform from piece to piece, has no misformed pieces, is free from foreign material, is simple to convey by chutes, is required in reasonably large quantities, and is reasonably simple to position. As far as application to a machine is concerned space limitations may affect the equipment very definitely, and sometimes the interlocking of the equipment with the machine cycle is a problem.

Two other factors should be kept in mind with all applications. Many of the unfavorable characteristics of the workpiece can be eliminated by a change in design. Sometimes holes or notches may be added, which serve no useful purpose other than to assist in orientation or positioning problems. Sometimes additional operations can be advantageously added to the workpieces in the bulk, which will simplify handling; such as tumbling, and in some cases, screening of chips or even thorough degreasing. The second factor is often overlooked but is of considerable importance: the experience that the manufacturer has had with the use of automatic handling equipment. A plant that has no such equipment would be a poor place to put, at least initially, some of the more complicated types of mechanisms. Experience in using and maintaining such equipment must be developed, just as experience in using and maintaining any other high production tools is necessary. Some of the very simple types of hoppers, chuting and inserters can be applied almost anywhere, but as the complications increase, such experience becomes more and more essential.

The mechanisms involved can be divided for convenience into four groups: the prime sorters or feeders, usually referred to as hoppers or hopper feeders; the secondary sorters or orientation devices; the conveying means; and the final positioning mechanisms. This grouping is necessarily arbitrary, as they blend and combine in endless variety, and this paper will be restricted to the first group.

Hopper Design

Fig. 1 shows a simple controlled-gate, external outlet-type hopper. This particular hopper is often called a pin gate, inasmuch as the gates are formed by pins which frequently are turned to special shapes and spaced around a rotating disc. They may be used for orienting, depending on part complexity, and frequently show high delivery rates. Well-known examples are the standard ratchet-driven rivet hoppers and types used to feed caps for beer and soft drink bottles. They may be inclined, have single or multiple chutes, ring-type exits, and may be indexed or continuously driven or varied in many ways to suit the piece part needs.

A widely used modification of this general type is the inclined internal gate design, which uses a slowly rotating suitably grooved sorting disc. Standard hoppers of this type

have been successful for such parts as screws and other simple parts.

Fig. 2 shows another type of gate hopper. This is usually found in small sizes used for eyelets and similar pieces. It consists of a stationary cup with a fixed, shaped gate attached to the chute. The pieces are wiped past this gate in a steady stream by a rotating wire brush. If placed horizontally, the brush omitted and the parts rotated by resting on a spinning disc, we have an arrangement commonly used for delivering cans and bottles. By adding deflectors and guide rails this type can handle various covers, fuse bodies and similarly proportioned pieces.

Another simple feeding principle used particularly for packaging fixed numbers of pieces in groups is drawn in Fig. 3. A slide having the requisite number of pockets is slid under a load of pieces in a hopper, and when pulled out, the pieces drop into a suitable funnel chute. When used for pins or odd shapes, the action frequently makes use of reciprocation or vibration. For high delivery, the slide may be a continuously or an intermittently rotated disc, and when used with timed gating, may be modified for accurate counting of large numbers of pieces, such as pills or balls.

A pocket type used for continuous timed delivery of one piece at a time is illustrated in Fig. 4. A counter-rotating brush prevents jams and the feeder is used for such items as small tubes and pop sticks, at a fairly high delivery rate. Lengthwise orientation in loading is essential.

One of the oldest principles used in parts feeding is illustrated in Fig. 5. This is the reciprocating-tube arrangement where a chute, entering at the vertex of a cone, is given a vertical back-and-forth motion relative to the parts held in the cone-shaped container. Used for pins or simple shapes, it is successful with reasonably uniform parts that are free of foreign material which may restrict flow. Agitation of the parts may be obtained in many ways besides reciprocation of the tube. Fig. 6 shows the use of an oscillating vane as an illustration. Units of this type have been built with deliveries of as high as 1000 pieces per minute, per chute, and when built with multiple chutes and counting escapements, show tremendous production rates for packaging simply shaped objects such as pills and capsules.

Before leaving this general class of mechanisms, mention should be made of some of the more outstanding variations. Balls or pins will feed in a steady stream into a tube end, either rotated through a mass of pieces or held stationary as the pieces are rotated past. By substituting suitable rails and deflectors or combination guides and knock-offs, the principle has been successfully applied to headed, slotted or other suitably shaped work pieces. In one instance, eventual success with an extremely abrasive piece was finally achieved by using a stationary flush gate, and wiping the pieces back and forth over the gate with an oscillating paddle.

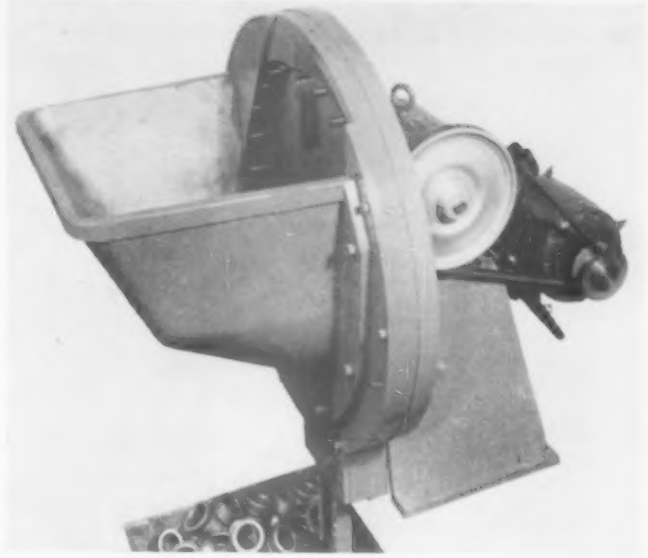
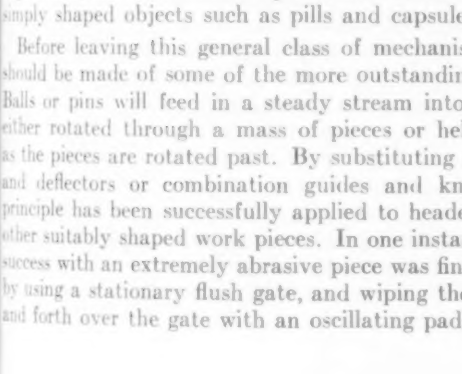
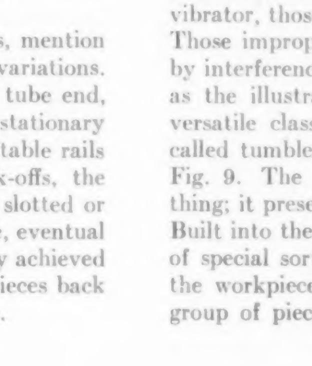


Fig. 1. Above is a simple controlled-gate, external-outlet type hopper. This type, the pin gate, may be used for orienting, depending on part complexity, and often show high delivery rates in production.

Related to the class of mechanisms just discussed is the reciprocating leaf type, illustrated in Fig. 7. The leaf in rising, either by straight line or rotation, through a load of parts, will pick up some in position to slide out of the stationary exit chute. Sometimes the leaf or leaves are stationary, and the pan with the pieces rises and falls, as in the usual type nail feeder. At present, this principle is seldom used for small parts, but is particularly adapted to relatively large, heavy pieces, especially of the headed variety. Fig. 8 shows a sketch of the so-called barrel hopper. The barrel frequently is cast with integral vanes and may be cylindrical, conical (sometimes on both ends), and may be tilted. In action, it lifts groups of parts and drops them on a rail which usually has a fairly low slope, and assisted by a vibrator, those properly positioned will slide down the chute. Those improperly positioned either fall off, or are deflected by interference points suitably attached to the chute. Crude as the illustrated device is, it has given rise to the most versatile class of feeders we have today. This is the so-called tumble type, a modern version of which is shown in Fig. 9. The base chassis of these hoppers does only one thing; it presents a controlled flow of pieces to a given point. Built into the hopper at that point have been a wide variety of special sorters or orientators whose design depends upon the workpiece requirements. Fig 10 shows a miscellaneous group of pieces for which feeders have been built recently,





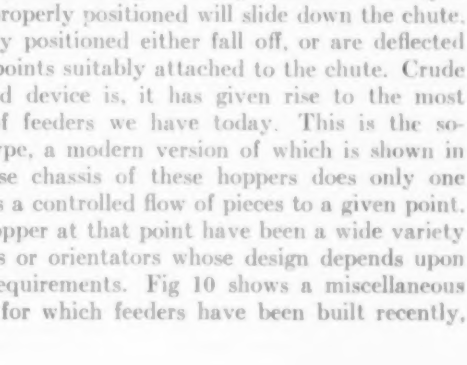


Fig. 2 (left) illustrates a gate hopper often employed for smaller parts such as eyelets. In Fig. 3 (center) is another simple feeding device used for packaging fixed numbers of parts in groups. When used for pins or odd shapes, reciprocating or vibrating motion is sometimes used with this type. Fig. 4 illustrates the pocket type, employed for continuous timed delivery of one part at a time. This type can be used for such items as small tubes and pop sticks, at a relatively high rate of delivery.

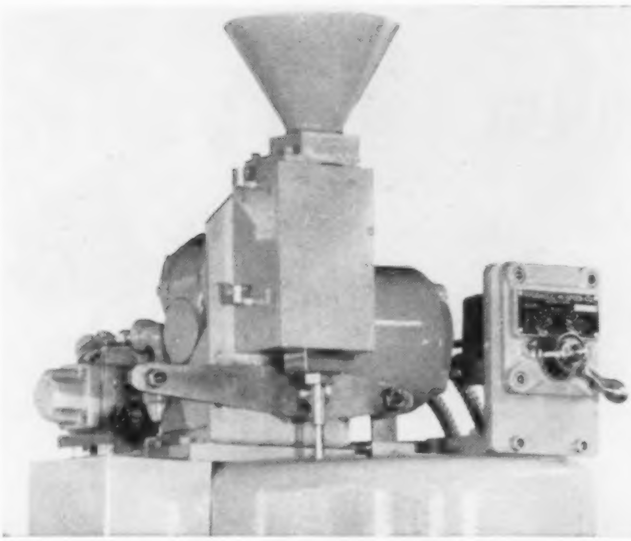


Fig. 5. The reciprocating-tube type of feed shown above is one of the oldest principles used in parts feeding. The chute, entering at the vertex of the cone, is given a vertical back-and-forth motion relative to the parts held in the container.

and the majority, including virtually all of the difficult pieces, have been handled in these tumble type hoppers. Large storage capacity is inherent; for example, a 32 in. size holds over two cubic feet of parts, by balancing the number, kind and size of the vanes, with the rotational speed of the drum, the tumble action can be made quite gentle and pieces actually pre-oriented to some extent. The chuting may range from simple winged channels or rails, to auxiliary powered and quite complex mechanisms. One feeder, for example, had four motors to drive all the necessary devices that were used. By suitable openings in the drum flange, chips and sometimes even certain defective parts can be eliminated. Vanes and areas subjected to parts impinging can be rubber covered if desirable, and chute angles can be readily changed or constructed at widely varying angles. Side, vertical or front delivery can be obtained.

Design Variations

Much can be done with vibration, particularly controlled or directional vibration. Simple dish-shaped hoppers have been built with one, or in some cases, numbers of fixed exit gates, wherein the parts have been given a rotational churning motion by vibration alone, and the feeding action was similar to the brush hoppers mentioned for eyelets. A slightly inclined chute, subjected to directional vibration, will walk pieces up an incline. This can be applied in many ways. A commercial hopper now on the market utilizes this principle to feed parts up a ramp winding around the inner periphery of a horizontally positioned drum. In this application, the entire drum is vibrated. Vibrating the chute only has advantages in some cases, as the load capacity is much greater and cross-vibration or auxiliary orientators can be added at suitable positions, without interfering with feed flow.

Prime feeders utilizing various conveyor means are very common and deserve mention, even though they are harder to classify. The inclined nest or pin conveyor principle, the horizontal conveyor with side vanes to swing parts into position, the jumps, turns and deflectors used particularly at higher speeds for eliminating double length or deformed pieces, are all common, but it is hard to say whether or not they are prime sorters, secondary orientators, or glorified chutes. They do serve, however, to lead us to a brief mentioning of some of the other classes of mechanisms necessary for complete parts handling.

A workpiece may require orientation in a number of ways. A ball requires none. A washer or straight pin needs one-way orientation. A headed piece, two ways. Flat, formed pieces may present themselves four ways and some rectangular or essentially three-dimensional pieces, may show eight or more positions. If orientation cannot be completed in the first sorter, a second or a third or even more sorters may be used. Obviously, even with the same workpiece, a number of types may be needed. Also, but not so obvious, even when no orientation problem exists, sorting means sometimes is required to eliminate faulty and extraneous pieces. Any of the sorting principles used in the hoppers discussed above can be used for secondary sorting and conversely, nearly any sorter that can be imagined, can be used in some types of hoppers for primary sorters.

Applying Feeding Mechanisms

In considering the application of these mechanisms, let us first consider a simple hypothetical case. One workpiece is manually loaded and unloaded on a machine. One operator is required for each machine, and the production rate we will assume is controlled by the operator's ability. Questions to consider are as follows: is the workpiece such that reasonably simple and practical handling equipment can be devised? How much operator attention would still be required? With fully automatic handling, how much would the production per machine be increased? With all machines in the group mechanized, how many machines could be eliminated and how many operators would be required? If it is an instance where increased production is needed, how does the cost of the handling equipment compare with the cost of additional machines that would be needed if they were hand loaded? If there are now ten machines, and by automatic handling, one man can obtain the necessary production from four machines, we obviously save the direct labor of nine men and the space and overhead of six unused machines, to offset the cost of the four installations. If the contemplated set-up is new, we not only have these savings to work with, but also the cost of the six machines saved.

Among examples picked from recent applications is the automatic feeding of a second operation into a punch press. Hand fed, the best possible production was every other revolution of the crank, as the operator had to kick the stroke on. Average production decreased to almost every third revolution. With automatic loading, the press was run on continuous cycle, with a net gain of 2-½ times production, as well as the complete elimination of operator hazard. Automatic loading of a dial-equipped, multiple-operation forming and coining press allowed only about 10 percent increase in speed, but resulted in nearly 50 percent greater

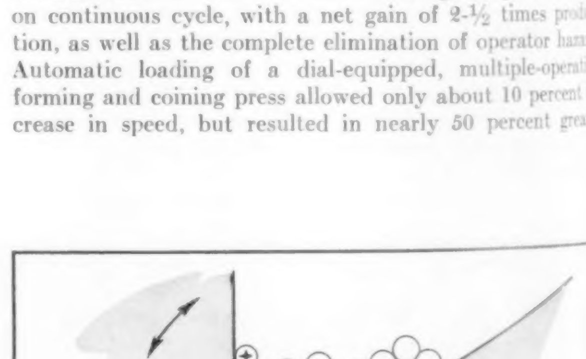


Fig. 6. Above is another application of the principle illustrated in Fig. 5. Here motion is imparted by an oscillating vane instead of tube reciprocation. Some units of this type are able to deliver as high as 1000 pieces per minute.

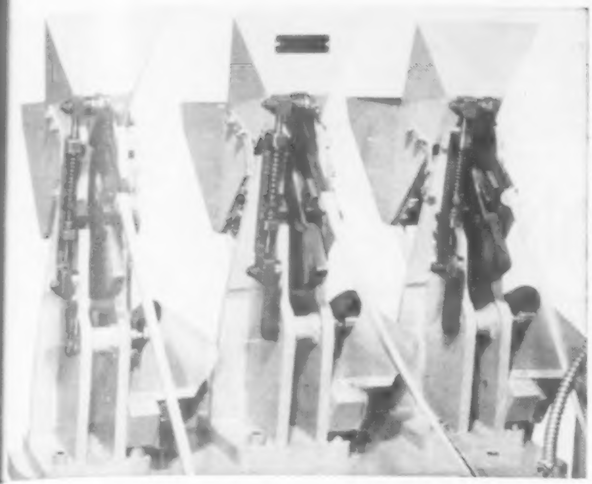


Fig. 7. In the reciprocating leaf arrangement shown above the leaf rises by straight line or rotation, and in so doing will pick up some parts which are in position. Adapted to large, heavy parts.

production due to having all nests filled. This latter result frequently occurs, and sometimes where two or more operators are all loading the same machine (a paint-spraying machine, for example) with the same part, in order to obtain the machine's potential production, both operators can be replaced with a single unit.

What this leads up to is this: with equipment and processes already in operation, definite savings can be made to amortize handling equipment, but if the installation is new, the use of handling equipment may not only result in the same savings, but may reduce the actual total investment that must be amortized.

Suppose two pieces are loaded into a machine, and unloading of the assembly in this case is automatic. There are now three possibilities. Either piece can be automatically handled. The same type of questions should now be asked for each combination. Often it happens that complete mechanization is a good thing, but often too, it will be found that there exists a law of diminishing returns, and a high percentage of gain can be obtained by retaining the operator and automatically handling only one piece. Consider the common application of driving a rivet into an assembly, which we can assume is one piece.

The production rate is much higher if the operator does not have to pick up and insert the rivet on each piece, and the rivet handling equipment is relatively inexpensive. To handle the assembly, which may be complex, may eliminate

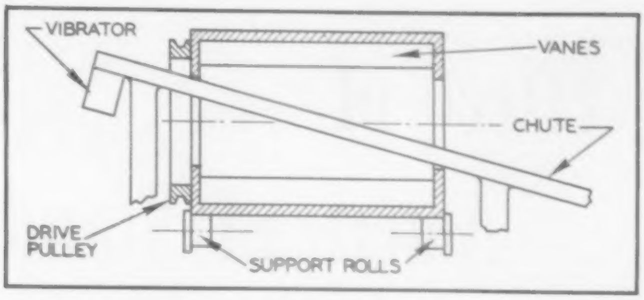
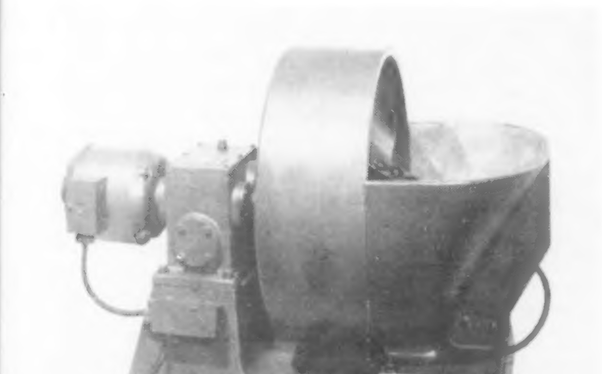


Fig. 8. The barrel hopper shown above lifts groups of parts and drops them on a rail, usually sloping, from which, assisted by a vibrator, those properly positioned will slide down a chute.

only one man and may cost too much to amortize in a reasonable time.

As the number of pieces increase, analysis becomes more involved, but the potential savings sometimes increase at a surprising rate. Consider the case where operations are performed on several machines. Can two or more of these machines be coupled together by direct transfer mechanisms or by conveyors loading into hopper equipment? Can operations be combined on one machine by adding handling equipment that now require two or even more machines, because of loading requirements? As we follow step-by-step through increasingly complicated combinations and sequences of operations, we are finally led to applications where large groups of operations are combined in single or coupled machines with savings that make large capital expenditures worthwhile. Such machines take a long time to design and build, and sometimes even a longer time to perfect. They should not be considered unless the plant personnel has experience in similar machines, and an understanding of their particular maintenance and operating characteristics.

Let us again consider the simple case of a single workpiece loaded into a machine manually. To make the case look good for automatic handling, we assumed a battery of machines and at least a doubling of production rate per machine. Assume now only one or a few machines, and no appreciable increase in final production rate. An installation of hopper and related equipment can now be amortized only by the savings of one man, and may be difficult to justify in the time management would like. Other questions should now be asked. Will this equipment build up valuable experience in the use and maintenance of such equipment? Will it help make more practical and easier, more complex applications elsewhere?



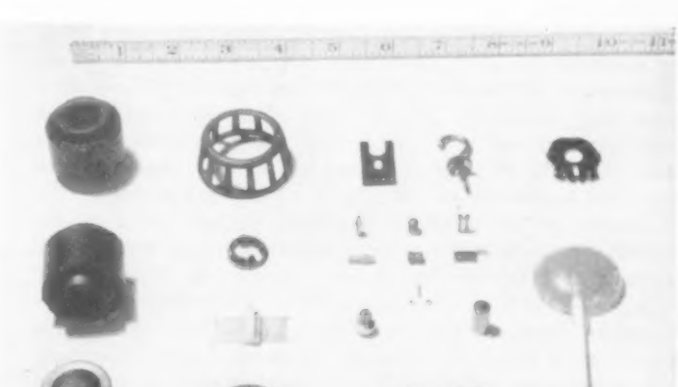


Fig. 9 (left) is an example of the principle illustrated above in Fig. 8. Known as the tumbler type, this unit is designed for the base chassis to present a controlled flow of pieces to a given point. Special sorters are available for various applications. In Fig. 10 (right) is shown a collection of widely differing products for which feeders have recently been built.

Effect of American Standards on Lathe Spindle Deflections

By Dr. M. Kronenberg
CONSULTING ENGINEER

THE ENGINEERING COMMITTEE on Standardization of Engine and Tool Room Lathes appointed by the National Machine Tool Builders Association, recommended in 1943 that the taper key drive spindle nose (L-type Spindle Nose) Fig. 1, and the cam lock spindle nose (D-type spindle nose) Fig. 2, be established as alternate American Standards. Although it had been hoped that one style of spindle nose might be used for all lathes, it has been found necessary again, when publishing the 1948 standards (ASA B 5.9—1948) to include both types because some engine lathe manufacturers favored type D spindle nose while others favored type L spindle nose.

The relative merits of the two alternate standards are sometimes determined on the basis of the number of parts involved in their design, cost of manufacture, ease of operation, accuracy of positioning, and other such considerations. To the author's knowledge, the investigation of the effect of standardization on the rigidity of lathe spindles has, heretofore, not been attempted.

It is therefore suggested that resistance to deformation be taken into consideration when machine tool standards are prepared because of the large effect which rigidity has on the working accuracy of the machines, their freedom from vibration and on other performance characteristics.

Accordingly, in this paper, methods will be discussed which are available for such investigations from other fields of engineering. They have been adapted to the special requirements of the tool engineer and provide information regarding deflection of the two alternate spindle nose standards. These methods do not apply to lathe spindles only, but also to other machines where workpieces must be mounted accurately and rigidly on revolving spindles.

Insofar as the American Standards do not give data required for such investigations, additional data were taken from the lathe spindle designs of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Deflections were determined for a small spindle size and a medium spindle size of either of the two alternate standards, whereby various conditions were taken into consideration such as chucking the work and holding it between centers.

L-type and D-type Designs

Figs. 3 to 6 have been prepared for readily comparing the two alternate standards in two sizes. The upper portions (Figs. 3 and 4) show the taper key drive spindle nose (L-type) while the lower portions (Figs. 5 and 6) show the cam lock design (D-type) of corresponding size.

It will be realized from these figures that the L-type spindle nose (Figs. 1, 3 and 4) is provided with a long, steep taper for supporting and centering face plates and chucks; it has a key for driving and a flanged nut for fastening face plates or chucks to the spindle.

The other standard, type D_1 spindle nose (Figs. 2, 5 and 6) is equipped with clearance holes in the outer bolt circle, each of which is provided with a cam for the purpose of engaging and locking the cam lock studs mounted in the back of the face plate or chuck.

Comparing the upper and lower portions of Figs. 3 to 6, it will also be noticed that the face plate, supported by a short taper in the case of the D-type nose considerably overhangs the spindle end. Conditions are reversed in the case of the L-type nose, where the taper is long, while the overhang is short.

Regarding the support of the centers in either design, the figures show that the center projects appreciably more beyond the spindle end in the case of the cam lock design (D-type nose) than in the taper key design (L-type nose). This difference is due to the fact that the sleeve of the D-types is not flush with the spindle end, leaving sleeve and center partially unsupported by the spindle. On the other hand, in the L-type standard, the sleeve is entirely supported by the spindle. While face plate standards have been included in the spindle nose standards ASA B 5.9-1948 chucks have not been taken into consideration sufficiently. It was therefore necessary to use, for the purpose of this investigation, the dimensions of commercially available chucks. Typical chuck mountings for the L-type spindle noses will be seen from Figs. 7 and 8, while those for the cam lock designs are shown in Figs. 9 and 10, again opposite the corresponding sizes of the taper key drive spindle noses.

It will be noticed that the face of the chucks of the L-type designs has a greater distance from the front bearings, than that of the alternate cam lock designs. The dash-dotted contour lines at the back of the chucks of Figs. 7 and 8 indicate suggestions for improving the rigidity of these chucks at the indicated places.

The investigations discussed here were carried out for 24 different cases, which include four types of spindle noses,

namely the small and medium size taper key drive noses (L_{oo} and L_1) and the small and medium size cam-lock noses (4 in. and 6 in.). Three different load applications were considered for each of the four spindle noses, namely loads acting at the face plate and loads acting at the center. Each of the twelve cases was investigated with regard to the deflection of the spindle nose only and with regard to deflection of the entire spindle.

The small size spindle noses (L_{oo} and 4 in. D_1) are used on spindles supported by two radial bearings, while the medium size spindle noses are employed on spindles with three radial bearings. These latter cases are statically indeterminate and involve therefore a somewhat more complex procedure of analysis.

Loads and Reactions

The forces tending to bend lathe spindles are acting at the face of the face plate or at the large diameter of the center in a direction perpendicular to the spindle axis, as indicated by arrows P on Figs. 3 and 5.

Although gears mounted on the spindles exert also forces trying to deform the spindles, they have not been included in this analysis because they do not act at the spindle nose, but rather between the bearings. They therefore do not enter this investigation, which deals with the effect of the spindle nose standards on deflections.

It is assumed throughout this study that the load at the face plate or at the center is 1000 lb. Such a load equals the vertical (main) cutting force produced in the case of turning soft cast iron with a feed of 0.004 in./rev and a depth of cut of 0.25 in. A load of 1000 lb is therefore a relatively small load which may often be exceeded in practice; it has been adopted for the present discussion because it permits calculation of deflections at other loads in a convenient way. Deflections of spindles made of steel increase substantially, proportional to the increase in the applied load.

In the investigations covering the deformation of the entire spindles, the width of the bearings has been simplified to a narrow support giving concentrated reaction forces. This permits also a comparison of the edge pressure at the bearings and of the angle of inclination of the elastic curve with the undeformed spindle axis. Since the design of the spindle left from the front bearing is optional, the L-type and D-type spindles have the same dimensions between front and rear bearings.

In the studies covering the deformation of the spindle nose only, it has been assumed that the front bearing is set tight and thus fixes the spindle rigidly there.

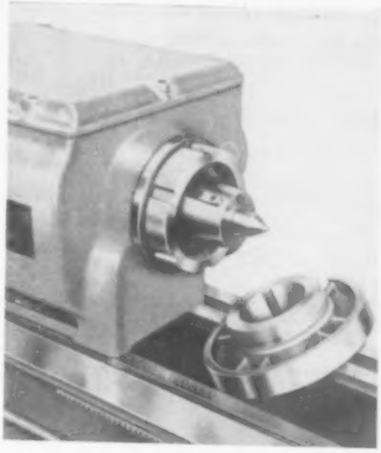


Fig. 1. Lathe headstock equipped with taper key drive spindle nose.
Fig. 2. Lathe headstock equipped with cam lock spindle nose.

Differences lie in the axial distances from the front bearings to the face of the face plate and to the large diameter of the center, and also in the diameters and moments of inertia of the spindle noses.

Deflection of the Entire Spindle Under Loads Acting at the Face Plate

The distances from the front bearing to the face of the face plate are respectively 3.75 in. for the L_{oo} spindle nose and 4.30 in. for the 4 in. D_1 type spindle nose. In the case of the L_1 type design, this dimension is 6 in., as against 6.23 in. for the 6 in. D_1 type spindle nose.

The overhang of the face plate beyond the spindle end is about ten times greater for the cam lock standard (4 in. D_1 type) than for the alternate taper key drive standard (L_{oo}), namely 1.20 in. as against 0.125 in. and about eight times greater for the 6 in. D_1 type spindle nose (1.94 in.) than for the alternate L-type design (0.25 in.).

Computation of the deflections of the entire spindle requires the determination of the moments of inertia for the various spindle diameters and also adjustments of the moment curve, resulting from the load, in accordance with the various spindle diameters.

In the case of the medium size spindles, the investigation must be extended to include the elimination of statically indeterminate conditions resulting from the three bearing support.

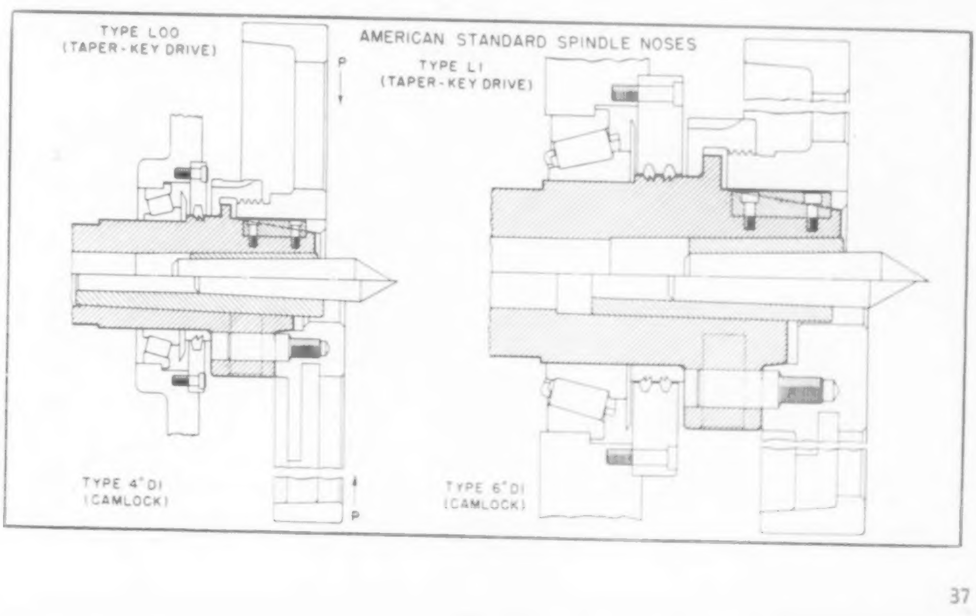


Fig. 3. Section through Type LOO American Standard Spindle Nose (taper key drive). (Top left).

Fig. 4. Section through type LI American Standard Spindle Nose (taper key drive). (Top right).

Fig. 5. Section through 4 in. Type DI American Standard Spindle Nose (cam lock). (Bottom left).

Fig. 6. Section through 6 in. Type DI American Standard Spindle Nose (cam lock). (Bottom right).

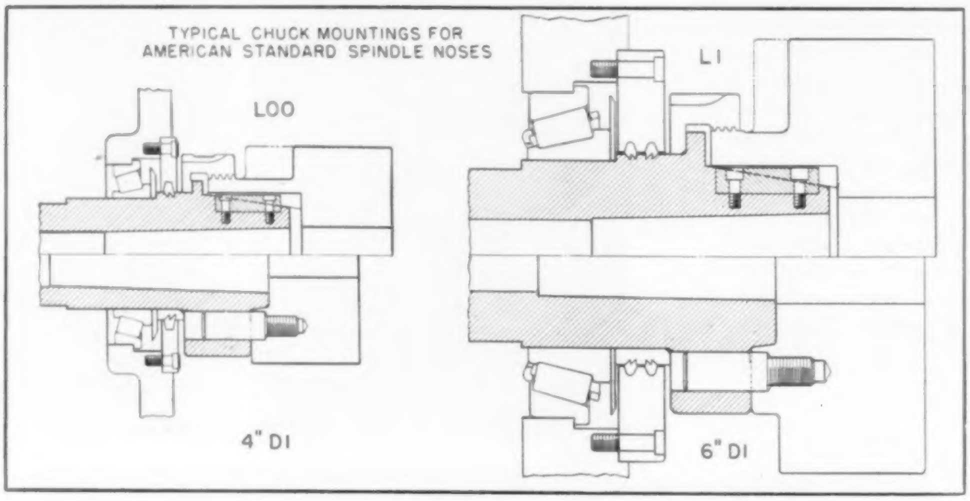


Fig. 7. Typical chuck mounting for Type Loo American Standard Spindle Nose.

Fig. 8. Typical chuck mounting for Type L1 American Standard Spindle Nose.

Fig. 9. Typical chuck mounting for Type 4 in. D1 American Standard Spindle Nose.

Fig. 10. Typical chuck mounting for Type 6 in. D1 American Standard Spindle Nose.

Small Size Spindles (Two Radial Bearings)

Lengthy derivations for these conditions shall not, however, be included in this presentation and reference is taken instead to Figs. 11 and 12, showing the graphical analysis of the two small size standards (L_{oo} and 4 in. D_1 respectively).

It will be seen that the deflection of the cam lock design 4 in. D_1 is 0.0023 in. per 1000 lb applied load as against 0.00185 in. per 1000 lb applied load for the alternate taper key drive standard (L_{oo}). Under these circumstances, the cam lock design deflects 24 percent more than the taper key drive design.

The reactions at the front bearings were found to be: 1270 lb for the L_{oo}, and 1310 lb for the 4 in. D_1 standard when a load of 1000 lb is applied at the face plate. At the rear bearings the comparative reactions were: 270 lb for the L_{oo} and 310 lb for the 4 in. D_1 standard per 1000 lb.

The angle of inclination of the elastic line with respect to the undeformed spindle axis beyond the front bearing can be computed from the straight portion of the elastic line. It is 1.92 min for the cam lock standard and 1.70 min for the taper key design L_{oo}. If the front bearings are set tightly, therefore, the edge pressure in the case of the cam lock design will be accordingly higher than for the L_{oo} design.

The straight portion of the elastic line is due to the stiffening effect of the face plate; that is, its large moment of inertia in comparison with the rest of the spindle.

Medium Size Spindles (Three Bearing Support)

The results of the analysis of the deflection of the two alternate medium size spindle designs (L_1 and 6 in. D_1) are shown on Fig. 13. Two elastic curves had to be determined for either standard in order to find the load at the center bearing and to eliminate the statically indeterminate condition of the three bearing design.

For the first elastic curve, the center bearing was disregarded and the deflection determined as if the spindle were supported only by the front and rear bearings. The elastic curves for this case are shown bent upwardly on Fig. 13 between the front and rear bearing and bent in the opposite direction at the face plate.

To determine the second elastic curve, the effect of the center bearing was introduced as a force required for eliminating the deflection at the center bearing, the magnitude of which is indicated by the first elastic curve. A "counter deflection" of the entire spindle is produced in this way and indicated by the lower curves. The resultants of the two

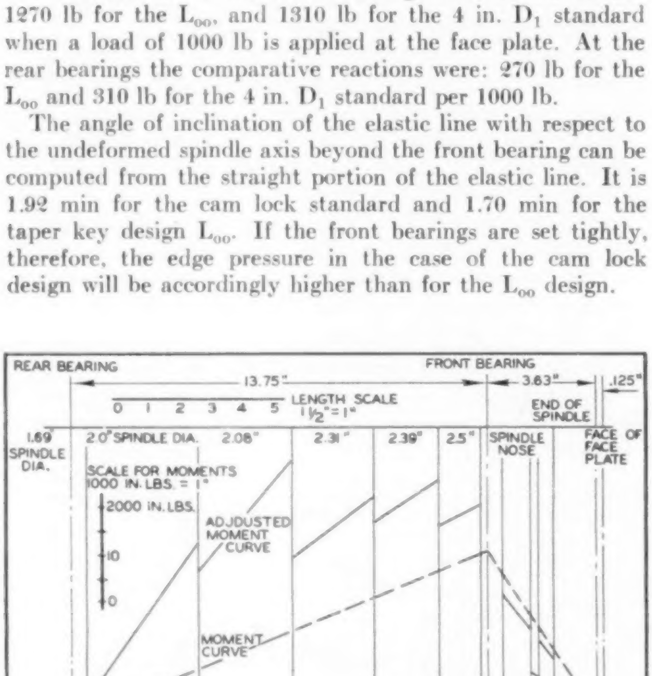


Fig. 11. Deflection diagram for Loo spindle, with two radial bearings.

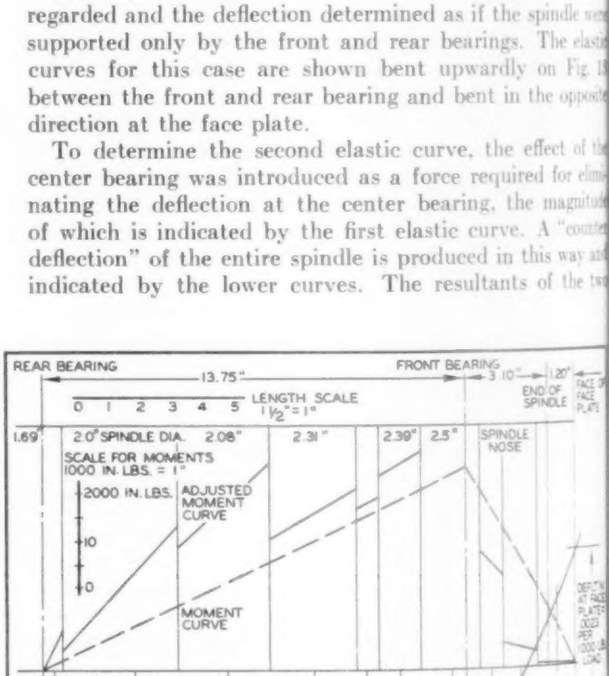


Fig. 12. Deflection diagram for 4 in. D1 Spindle, with two radial bearings.

elastic curves for each design represent the actual deflection curves passing through all three bearings.

The center bearing has the effect of reducing the deflection at the face plate by 45 percent, namely from 0.0035 in. to 0.0019 in. in the case of the L_1 type spindle and from 0.0038 in. to 0.0021 in. per 1000 lb load for the 6 in. D_1 type design. The resultant deflection of the cam lock design is therefore 11 percent greater than that of the taper key design in the case of the medium size spindles with three radial bearings.

The load at the center bearing is 790 lb for the L_1-design and 820 lb for the 6 in. D_1 design per 1000 lb load applied at the face plate. The reaction at the front bearing is 1560 lb for the L_1 type and 1580 for the 6 in. D_1 type per 1000 lb applied load. When the load is applied at the face of the chuck, rather than at the face of the face plate, the relationship between the deflections of the entire spindles of the two alternate designs is reversed. Under these circumstances, the small size spindle with cam lock nose deflects 25 percent less and the medium size spindle 9 percent less than the corresponding taper key drive spindles.

Deflections of Entire Spindle Under Loads Acting at the Center

The deflections of the entire spindle when the load is applied at the center has been determined by the graphical methods corresponding to those shown in Figs. 11 and 12 for loads at the face plate. In the case of the small type—(L_{00}) design, the deflection was found to be 0.0027 in. as against 0.0031 in. for the 4 in. D_1 standard; the latter deflects therefore 15 percent more than the taper key drive design. Deflections under loads acting at the centers in the case of the three bearing designs (L_1 and 6 in. D_1 types) were estimated, assuming that they would be somewhat larger than the face plate deflections of the three bearing designs.

Deflections of Spindle Nose Only

The preceding calculations are based on the reduction of the bearings to narrow supports, permitting a pivoting of the spindles within the bearings. The following investigations are based on the opposite assumption, namely that no deflection occurs within the bearing. This is equivalent to stating that the spindle nose is fixed at the front bearing

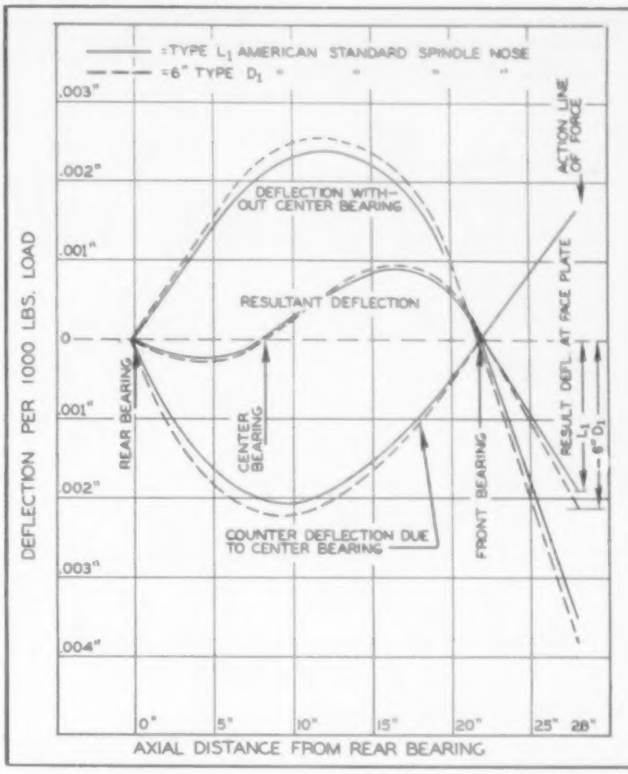
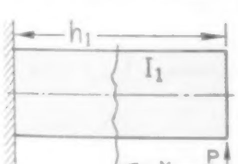


Fig. 13. Elastic curves of the lathe spindles supported by three bearings (L1 type and 6 in. D1 type spindle noses).

and that all deformations take place outside the front bearing. The possibility of rotation of the spindle is, of course, not affected by this assumption.

Under these circumstances the spindle nose represents a shaft with various diameters, fixed at one end and loaded at the other one by a force acting at 90 deg to its longitudinal axis. Mathematical formulas give better information in these cases than the graphical methods employed previously. However, the practice of basing the calculation of deflection on the smallest diameter only is not recommended.

FIG. 14. DERIVATION OF FORMULA FOR SPINDLE NOSE DEFLECTION



FIRST DIAMETER

Applying the fundamental equation *) to this case and using:

$$M_1 = P.x \quad ; \quad \frac{\delta M_1}{\delta P} = x \ , \quad \text{with}$$

the limits of the integral between 0 and h_1 results in:

$$f_1 = \frac{P}{E.I_1}\int_0^{h_1} x^2 \ dx = \frac{P \ . \ h_1^3}{3.E.I_1} \qquad (1$$

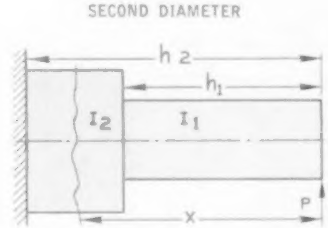
Applying the fundamental equation *) to the second diameter and using:

$$M_1 = P.x \quad ; \quad \frac{\delta M_1}{\delta P} = x \quad \text{with}$$

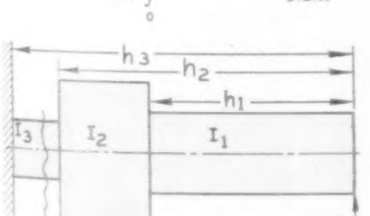
the limits of the integral between h_1 and h_2 results in:

$$f_2 = \frac{P}{E. \ I_2}\int_{h_1}^{h_2} x^2 .dx = \frac{P(h_2^3 - h_1^3)}{3.E.I_2} \qquad (2$$

SECOND DIAMETER



THIRD DIAMETER



In the same way, using limits of the integral between h_3 and h_2:

$$f_3 = \frac{P(h_3^3 - h_2^3)}{3. \ E.I_3} \qquad (3$$

*)Fundamental equation for displacement of a point located on an elastic body loaded by force P:

$$f = \int \frac{M_1 \ . \ \delta M_1}{E.I. \ \ \delta P} \ dx$$

where: f = deflection, M_1 = moment acting in section; I = moment of inertia of section; E = modulus of elasticity; x = distance of considered section from load P.

Total deflection $F = f_1+f_2+f_3+ \ldots$

Hence:

$$F = \frac{P}{3 \ E}\left(\frac{h_1^3}{I_1} + \frac{h_2^3 - h_1^3}{I_2} + \frac{h_3^3 - h_2^3}{I_3} + \ldots\ldots\right)$$

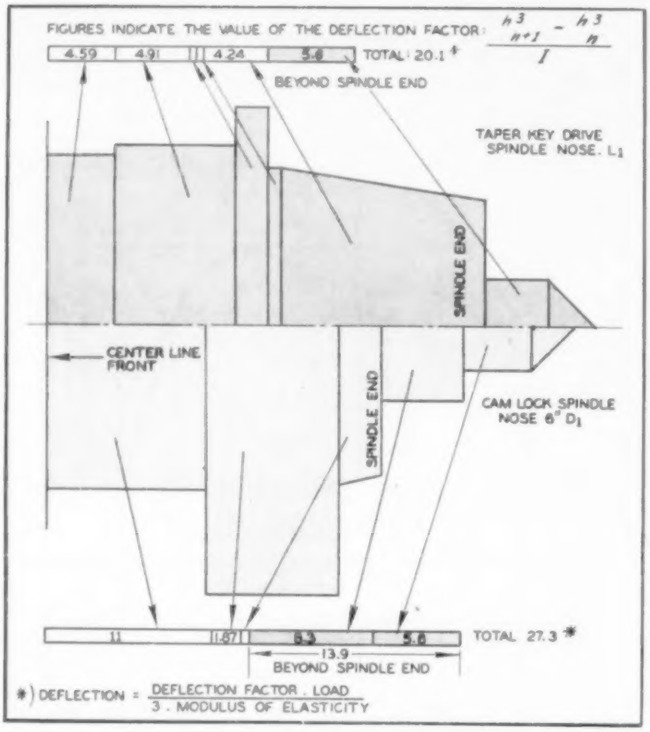


Fig. 15. Itemized deflections of L1 type and 6 in. D1 type spindle noses when considered fixed at the front bearing and with load applied to center.

It was necessary to adapt formulas not generally used, to the present conditions; they were found very useful for determining deflections of stepped shafts, fixed at one end. These equations are based on the fundamental formula for the displacement of a point located in the action line of a force on an elastic body. Details will be seen from Fig. 14, winding up with an equation which takes into account the deflection of each individual section of the shaft. This individual deflection is represented by a factor which involves the cubes of the distances from the force and the fourth power of the diameters as moments of inertia.

With the aid of this equation it is possible to evaluate the contribution which each section makes to the total deflection of the shaft.

Reference is taken to Fig. 15 showing the itemized deflections of the medium type spindle noses (L_1 and 6 in. D_1) when fixed at the front bearing and with loads applied at the center. The upper portion of Fig. 15 refers to the L_1-type spindle nose, the lower one to the 6 in. D_1-type nose. The value of the deflection of each section of the spindle nose is graphically shown above and below the two sketches.

As an example, it will be noticed that the deflection factor for the center (at the right hand end) is the same for both spindle standards, namely 5.6. The taper of the L_1 type standard has a deflection factor of 4.24, while the sleeve of the 6 in. D_1 type standard has a factor of 8.3. The total deflection factor for the taper key drive standard L_1 is 20.1 as against 27.3 for the alternate 6 in. D_1 design. Since the deflections are directly proportional to these factors it follows that the deflection of the cam lock design 6 in. D_1 is 36 percent greater than that of the taper key drive design L_1. The actual value of the deflection is obtained by multiplying the factors by the following constant:

$$\frac{\text{Load}}{3 \times \text{Modulus of Elasticity}}$$

It is also interesting to note that the portion projecting beyond the spindle end on Fig. 15 deflects appreciably more in the case of the 6 in. D_1 design (factor 13.9) than in the case of the L_1 type design (factor 5.6). In this portion, therefore, the cam lock design 6 in. D_1 deflects approximately 1.5 times more than the taper key drive design L_1.

The deflections for the various other cases where the spindle is considered fixed at the front bearing have been computed in the same way as indicated on Fig. 15. When the load is applied at the face of the chuck and the spindle is fixed at the front bearing, the deflection of the small size cam lock design (4 in. D_1) is 4 percent less than that of the alternate L_{00} design. In the case of the medium size designs, however, the advantage lies with the taper key drive spindle nose, since cam lock spindle nose (6 in. D_1) deflects 16 percent more when the load is applied at the chuck than the L_1 type design under the same circumstances.

It is evident that the distance of the load from the front bearing is not a sufficient criterion for comparing deflections; it is rather necessary to consider also the diameters of the bearings and of the spindle nose with respect to their distance from the load as indicated by the Fig. 14.

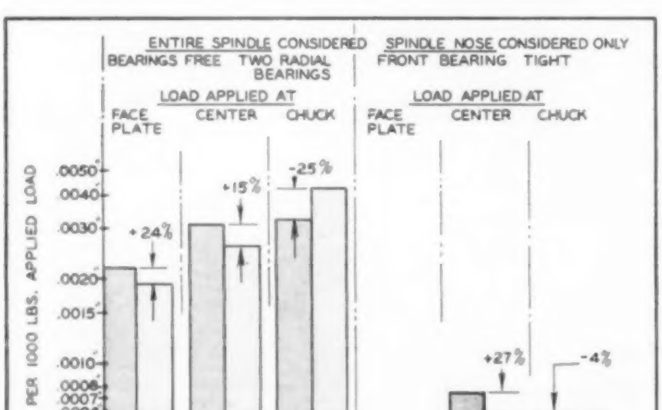


Fig. 16. Synoptical deflection diagram for small size lathes.

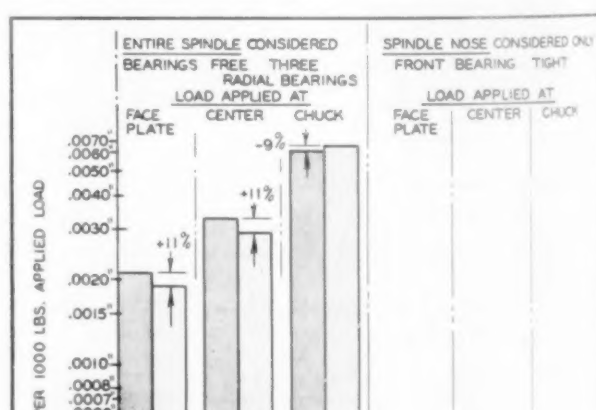


Fig. 17. Synoptical deflection diagram for medium size lathes.

Forming Sheetmetal by the Marform Process

By R. B. Schulze

GENERAL SUPERVISOR OF MANUFACTURING RESEARCH
THE GLENN L. MARTIN COMPANY

THE MARFORM PROCESS was developed to meet the aircraft industry's needs for a multitude of different parts with a low quantity of each part. In addition, a process which gave high quality with a low tooling cost was a vital object. The Marform process can best be understood by first understanding the processes which preceded it: the Guerin process, and deep drawing with a steel die.

Steel draw tool construction is generally well known but a short review is in order. A steel draw tool consists of a male portion which is often called a punch or stake, a female portion which is often called the die, and a top and bottom pressure pad. The female portion of the tool can be eliminated in the case of a non-bottoming die in which case the bottom pressure pad becomes a draw ring. This economy can be made when the shape to be formed is one which naturally clings to the punch. The punch and die portion of the tool are of course necessary to define the shape to be made. The two pressure pads are necessary to confine the metal to a flat shape as it enters the die.

This latter statement is one which should be considered carefully, since it should be well understood. The flat metal blank used in forming a part must have an area almost equal to the final outside area of the shape being formed. When the shape to be formed is very deep, a blank of relatively large diameter must be used to form a part of small diameter. In other words, the original outer periphery of the blank must shrink radically in the forming operation. The metal blank, however, has very little rigidity of its own, and would therefore tend to cripple or wrinkle rather than shrink. Such wrinkles would prevent the metal from entering between the punch and the die if allowed to exist. The pressure pads confine the metal to a flat plane as it shrinks from a larger to a smaller diameter.

The pressure pads should squeeze the metal just tightly enough to prevent wrinkles from forming, since extra pressure would add unnecessary resistance to the flow of the metal into the die. The pressure required is not constant; it varies with the diameter of the blank and with several other factors such as the shape of the part to be formed and the pressure applied on the punch. However, the pressure is applied to the pads in a steel die either by means of springs or air cylinders in most applications. Springs provide variable pressure but the variation is dictated by the springs and not by the requirements of the part. Air cylinders generally give a constant pressure for the full stroke.

On the other hand, the Guerin process substitutes for the normal metal female portion of the tool. However, there is no good substitute for the pressure pads employed in a steel die. Although the process of forming with a semi-fluid medium such as rubber was first experimented with a number of years ago, the process has risen to its present level of usefulness in the aircraft industry, since it offers an opportunity to save a considerable amount of money in tool cost on short production runs of applicable parts.

The rubber is contained in a retainer which is mounted on the upper platen of a hydraulic press. A platen is also mounted on the lower bed of the press directly below the rubber retainer. The lower platen is just large enough to match the size of the inner surface of the rubber retainer. The retainer and the lower platen therefore form a seal to prevent excessive escape of rubber from the retainer when pressure is applied.

The tooling employed with this process is simple, since it consists only of a male punch. It is even further simplified by the fact that the forming operation is accomplished with a pressure stroke which is softened by the rubber, so that softer tooling materials such as Masonite may be employed. Tooling cost is, of course, much less than that of a complete steel tool for the same purpose.

The Guerin-process tools are placed on the lower platen for the forming operation and the metal blanks to be formed are placed on the form blocks, although locating pins are generally employed to ensure proper location of the blank on the tool. Any arrangement of form blocks can be placed around the surface of the lower platen.

Satisfactory results are obtained with the Guerin process when the stamping operation involves a straight bend in the metal, stretching of metal, or a combination of the two. This is because there is not any tendency to wrinkle in bending metal on a straight line or in stretching metal into a shape such as a concave flange, or a stretched depression such as a bead. However, in shrinking metal into such a shape as a convex flange or a deep drawn cup, wrinkling may result.

This inability of the Guerin process to shrink metal is due to several factors. First, the pressures employed have not

been of a high enough magnitude to solidify the rubber to a degree which would give it sufficient local stiffness to prevent wrinkles. A simple increase in pressure would not solve the problem, since the basic difficulty is the fact that some movement of the retainer must take place against the tools and forming blanks before any pressure is built up in the rubber. In other words, wrinkles can begin to form before any pressure is built up in the rubber to prevent their formation. This is true regardless of the eventual pressure available, and is important, since it is difficult to remove wrinkles once they have begun to form.

For example, the Marform process utilizes the male punch employed in the Guerin process but it also requires a single plate surrounding the punch on which the flat metal rests. It is unnecessary to make either a female die, pressure plate or draw ring. The elimination of half the parts formerly required for a drawn part saves more than half the cost of the tool in many cases. One reason is the fact that the female portion of the tool is often the hardest to make, since it is more difficult to work down in a hole. The second, more important reason, is that the matching problem between the two halves of the tool has been eliminated.

The Marform punch can be made of Masonite for short runs on soft materials. Cast Kirksite can be employed for longer runs or where harder materials are to be formed. However, steel punches are generally employed for production runs, especially on harder materials. The flat plate on which the metal rests is always made basically of steel. This plate must be flat and smooth but the fit between it and the punch is unimportant except when forming very thin metal such as ten or twenty thousandths-thick stock. A thin Masonite overlay is often employed on the steel plate on short runs to save the cost of grinding the surface of the steel plate. The inside periphery of the plate, where it surrounds the punch, and outside periphery of the plate can be torch cut in most instances.

Another advantage of the Guerin process over steel dies is that set-up time on a tool is negligible and any arrangement of tools can be distributed around the lower platen. This is an important cost item when compared to the time and effort involved in setting up a steel die. The Marform process again strikes an effective compromise between the two. Here the set-up time on a tool is relatively small, since the male and female portions of the tool do not have to be matched and since more than one form block can be used in one pressure plate or in separate pressure plates on the same machine. The pressure requirements and depth of stroke must of course be equal, however, for all parts formed at the same time.

As was stated earlier, the Marform process was designed to combine the forming ability of a steel die with the economical tooling of the Guerin process. Although the Marfor process does not give the embossing definition of a steel d at least in its present state, it outperforms a steel die i many cases. For example, the forming ability of a tool material is generally judged on the basis of the depth round cup it will draw on a given size of punch. This ca also be stated another way by saying that the basis of draw ability is the percentage reduction in area which can b made on a blank in one forming operation.

A 40 percent reduction in area is generally expected on steel die when forming aluminum alloys. A reduction in are of 50 percent can be attained if extra diligence is exercised However, a reduction in area of 57 percent is considered normal in Marform work on the same material and figure as high as 70 percent have been attained in testing operations.

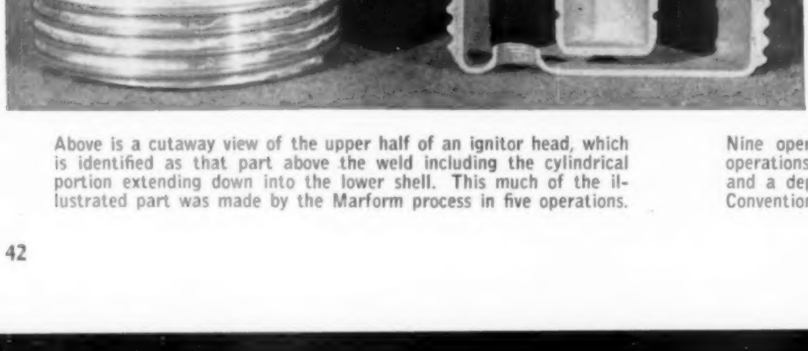
Similarly a cup depth equal to the radius is normally expected from a steel die while a depth equal to 1½ time the radius is normally expected in Marform on the same material. Depths equal to 1.2 times the diameter or 2.4 times the radius have been attained in certain cases. This means that the Marform process can sometimes form a part in one operation which would otherwise require two operations.

There are several apparent reasons for this added formability. One is that the rubber has a certain cushioning effect and therefore prevents rapid application of strain at any point on the metal in contrast with the situation in a steel die where localized applications of strain may on occasion be quite severe.

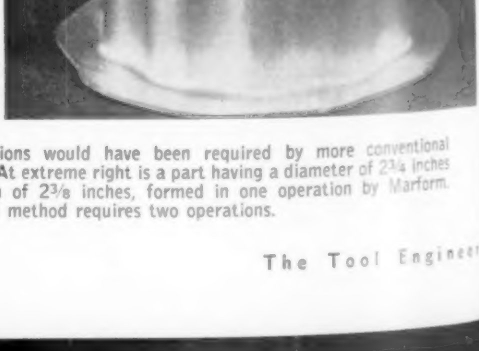
The rubber also exerts a lateral pressure during the forming operation which is a direct result of the applied forming pressure. This lateral pressure has the effect of locking the metal already formed to the male portion of the tool. An accumulation of strain at the punch radius is prevented, and the strain is distributed uniformly over the complete surface of the piece to be formed. The importance of this is demonstrated by the fact that when failure occurs on most steel die-formed parts, the top pops out of the part, with the failure along the line of the punch radius.

Prevention of strain concentration at the punch radius not only enables the part to be forced deeper, but also causes the part to be more satisfactory in certain applications where uniform thickness is important.

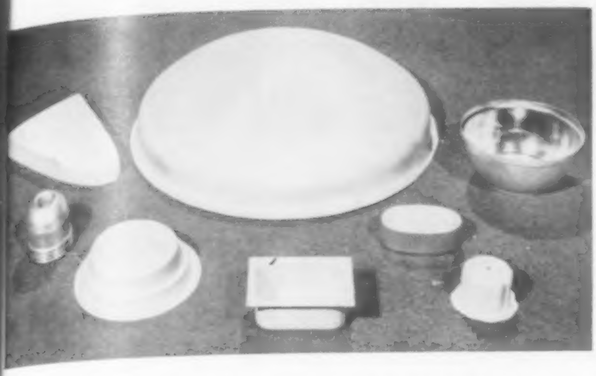
Another related advantage is the fact that the rubber locks the material against the punch. This arises from the phenomenon that local elongations in metal can safely be higher than elongations over a relatively longer gage length. The rubber automatically causes the metal to be strained over a shorter gage length by locking it just above the instantaneous point of forming and therefore provides the



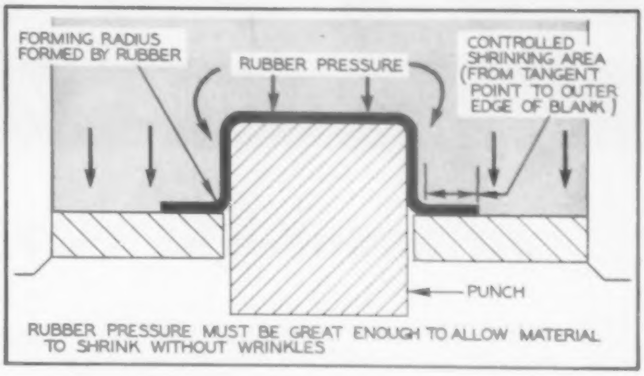
Above is a cutaway view of the upper half of an ignitor head, which is identified as that part above the weld including the cylindrical portion extending down into the lower shell. This much of the illustrated part was made by the Marform process in five operations.



Nine operations would have been required by more conventional operations. At extreme right is a part having a diameter of 2¾ inches and a depth of 2⅜ inches, formed in one operation by Marform. Conventional method requires two operations.



Above is an assortment of metal parts formed by the Marform process. The parts shown range from 0.010 aluminum to 0.109 deep drawing steel and represent a large variety of shapes and sizes which have been successfully formed by this method.



This sketch illustrates the Marform punch and plate on which the as yet unformed metal rests. These two elements constitute a Marform tool. The rubber in the Marform retainer is also illustrated along with the fact that the rubber pressure is exerted in all directions against the part.

elongation available from the shorter gage length.

Further, with the Marform process the machine can provide an exact required pressure on the material at each desired depth of stroke. This pressure can be varied in either direction: it can start low, be increased, and then drop off, or it can gradually be increased from start to finish, or it can be started at a high value and then dropped gradually to a lower value. The pressure variation can be infinite within the minimum and maximum values, and therefore it is not a series of steps.

Another advantage from a forming standpoint is the precision with which a given shape can be formed. Sheetmetal parts can be made to a tolerance of plus or minus 0.002 in. A tolernce of plus or minus 0.005 in. is commonly obtained on parts where the shape is sufficiently rigid to maintain such accuracy.

Material as thin as 0.010 in. has been successfully formed, and a 0.012 in. gage cup was deep-drawn to the point where the depth of the cup was 0.9 of the diameter of the cup. Gages as thick as 0.675 in aluminum alloys and 0.102 in 1010 steel have been formed. This is not necessarily the maximum but represents the thickest gages formed to date.

The problem of applying finishes to formed shapes is sometimes critical from the economy standpoint. This is particularly true of polished surfaces. It is much more economical to polish material in the flat state and then form the parts, but this results in marred finishes when the normal processes are used. However, round cuts have been formed on the Marform machine successfully where the material had been previously coated with such finishes as vinyl, aircraft paints and crackle paints. The experiment was also performed with polished material.

Tapered shapes are a major forming problem. Any tapered shape tends to wrinkle, because of the distance between the punch and the pressure plates of the die at the start of the forming stroke. Tapered shapes are important to industry because they are attractive, because they will stack better, and because they save metal. While it is difficult to quote a rule on what can be accomplished with our limited experience to date, the following examples will serve as a guide as to the severity of taper which can be formed without wrinkles. Consider a four-inch diameter on the top of the punch and with a taper outward toward the bottom of the punch. On such a punch the gap could be 0.5 in. between the punch and the supporting pressure plate, for 0.025 in. thick steel. This gap can be increased to ¾ inch with the gage of the steel increased to 0.050. The gap can be 3/16 of an inch with 0.025 gage aluminum and ⅜ inch with 0.050 aluminum. Developments under way at present may result in a radical improvement in the permissible taper in one operation.

We are currently using presses of 800 ton and 3500 ton capacity in Marform work. The 800 ton press is used in conjuntion with a Marform unit which has a 16 x 18 inch forming area, and provides a forming pressure of 5,560 psi. The 3,500 ton press is used with a 28 x 31 inch forming area which offers a theoretical forming pressure of 8,060 psi. However, utilization of this maximum pressure increases the maintenance cost on the equipment, so the press is not used 7,000 psi. The pressure noted can be directly translated into working pressure on the metal in the Marform unit itself.

Capacity of the small press enables us to obtain 120 cycles per hour, which may result in a multiple of that number in pieces per hour since often more than one piece can be formed at one time. The large press operates at a speed of 60 cycles per hour, and this rate can also be multiplied by the addition of more parts in the same stroke. This speed of operation is based entirely the speed of the hydraulic press equipment on hand and can be increased to match the speed of any faster hydraulic press. No attempt has been made as yet to apply a Marform machine to a mechanical press but we believe that the application would be successful if the press had sufficient daylight opening and the proper power.

JIC Identification Symbols for Hydraulic Diagrams

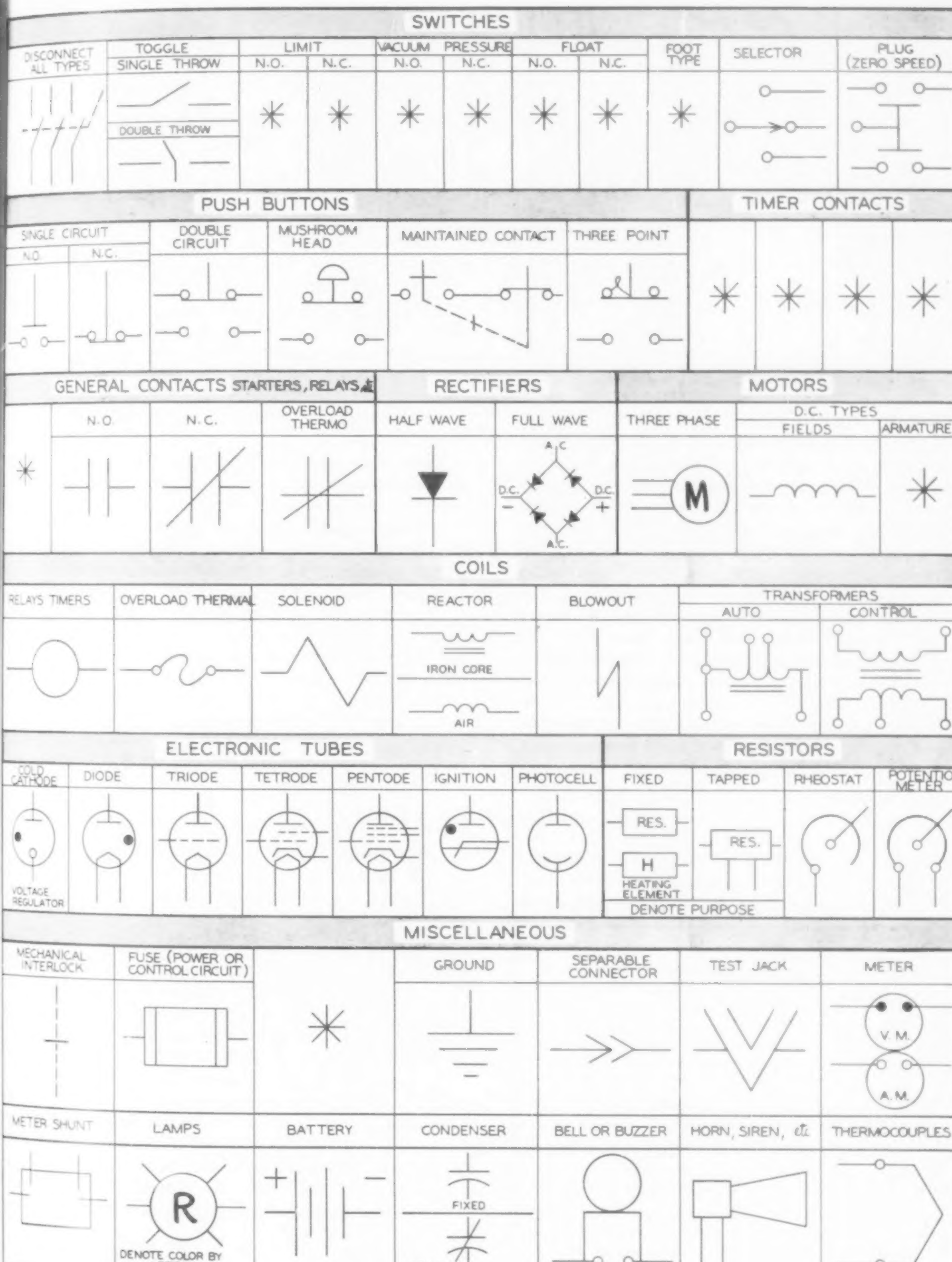
BASIC COLOR CODE

ALUMINUM	STEAM
BLUE	AIR PRESSURE
GREEN	WATER
YELLOW	GAS AND FLAMMABLE LIQUIDS
RED	SPRINKLER SYSTEMS OR FIRE PUMP STEAM (OLEUM SPIRITS AND AMMONIA)
BLACK	DRAINS

WHEN A FURTHER BREAKDOWN OF PIPING IDENTIFICATION IS REQUIRED, THE FOLLOWING VARIATIONS MAY BE USED.

PIPE	BASE COLOR & BAND
HIGH PRES. STM. 100 #/SQ. IN. & OVER	ALUMINUM WITH RED BANDS
MED. PRES. STM. 20# - 75 #/SQ. IN.	ALUMINUM WITH YELLOW BANDS
LOW PRES. & EXHAUST STM. UP TO 15 #/SQ. IN.	ALUMINUM WITH BLUE BANDS
BOILER FEED	ALUMINUM WITH LIGHT GREEN BANDS
BLOW OFF	BLACK WITH ALUMINUM BANDS
VACUUM & LOW PRESSURE RETURNS	LIGHT GREEN WITH YELLOW BANDS
HIGH PRESSURE DRIPS & TRAP LINES	ALUMINUM WITH BLACK BANDS
LOW PRESSURE AIR	BLUE (OIL PROOF) ALUMINUM BANDS
DRINKING WATER	LIGHT GREEN WITH ALUMINUM BANDS
RECIRCULATED COOLING WATER	LIGHT GREEN WITH BLACK BANDS
HOT WATER — A) DOMESTIC	LIGHT GREEN WITH RED BANDS
B) HEATING	LIGHT GREEN WITH BLUE BANDS
FIRE PUMP STEAM	RED WITH ALUMINUM BANDS
OXYGEN	BLACK WITH RED BANDS
ACETYLENE	YELLOW WITH BLACK BANDS
DUCO AND THINNER	YELLOW WITH BLUE BANDS
AMMONIA	RED WITH BLACK BANDS
OLEUM	RED WITH YELLOW BANDS
FUEL OIL	BLACK WITH YELLOW BANDS
ELECTRIC CONDUIT	RED BOLT ON ANY BACKGROUND
GASOLINE	YELLOW WITH RED BANDS
HYDROGEN	YELLOW WITH GREEN BANDS
LIQUID CEMENTS	YELLOW WITH ALUMINUM BANDS

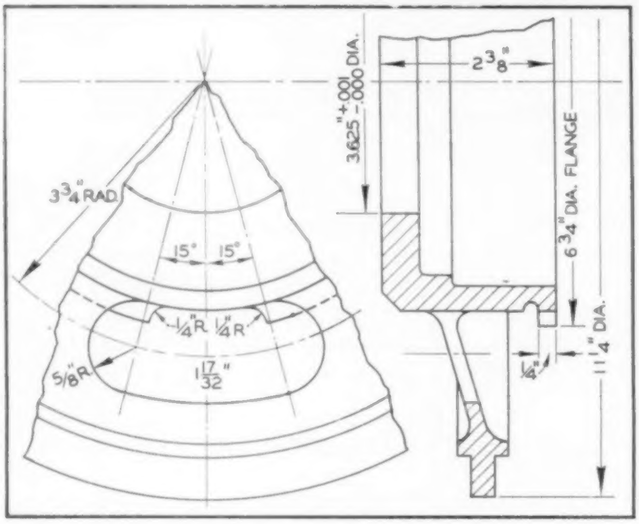
JIC Standard Symbols for Electrical Diagrams

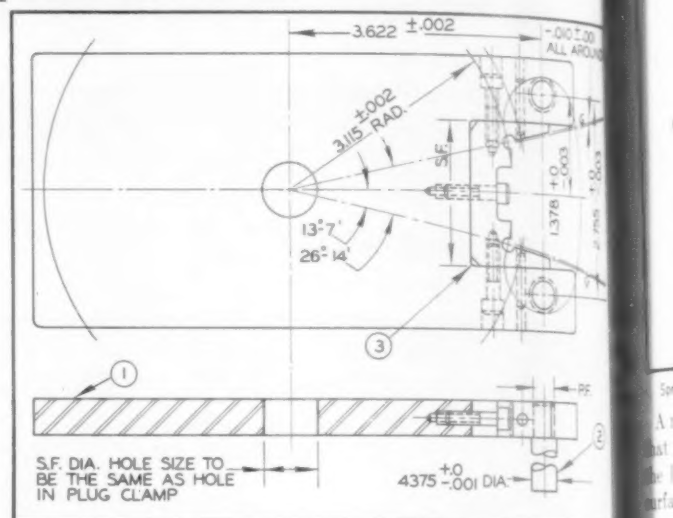


GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Combination Clamp and Cutter Guide





The angular relation and length of the 1 17/32 in. recess, Fig. 1, were accurately duplicated by means of the combination clamp shown in Fig. 2.

The milling of a stainless steel forging, partially shown in Fig. 1, was greatly facilitated by use of the combination clamp and cutter guide shown in Fig. 2. In a preceding operation, a ⅝ in. radius x 30 deg slot has been milled in the webbed section of the forging. It was next necessary to turn the part over and to locate and mill the ¼ in. radius x 1-17/32 in. long recess in the 6-¾ in. dia. x ¼ in. thick flange. This milled recess had to be located centrally with the previously milled slot.

The tooling used in the preceding operations included a plug mounted on a milling machine index table. This plug located in the 3625 in. bore of the forging, and contained a stud, used for clamping the part, which in turn had a portion of its body ground off for a slip fit in the hole of a plug-type clamp. When milling the recess in the flange, as described above, the forging was set on the index table flange side up. The operation completed, the plug-type clamp was replaced by the combination clamp illustrated and further described below.

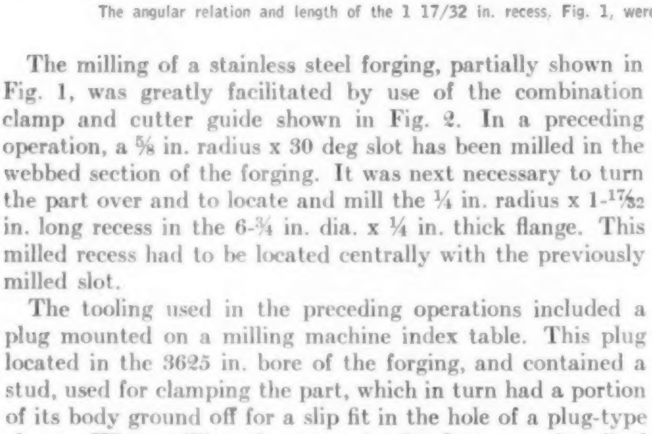
This clamp—Fig. 2—consisted of a piece of flat steel (1) with a reamed hole in its approximate center, which slipped over the stud previously described. Two locating pins (2) accurately nested in the previously milled slot, thus locating the clamp in proper angular position. A hardened and ground gage block (3) of tool steel, was inset into the clamp and secured with screws and dowels.

Using a 0.010 in. thick feeler and a ½ in. dia. end milling cutter, it was then an easy matter to locate the recess in each forging. Depth of cut, and angular movement of the index table to produce the 1-17/32 in. long slot were readily determined, and the arrangement eliminated any need for layout work to locate the recess.

Clement F. Brown
Willow Grove, Pa.

Simple Chucking Fixture

A simple fixture for accurately chucking and maintaining concentricity on internal grinding, consists of a body (1), a split collet (2) and a closing screw (3). While the fixture illustrated was especially designed for the workpiece indicated by (4) the principle may be applied to other work which must be chucked on the O. D. and, at the same time, must be accurately bottomed.



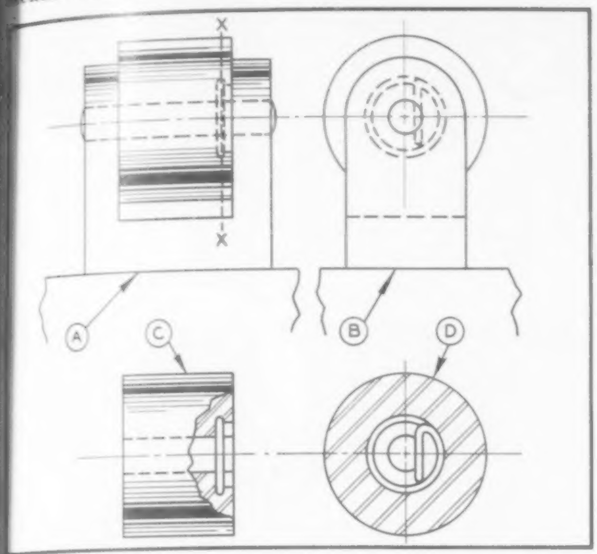
Workpieces, similar to that indicated by (4) in the illustration, may be accurately chucked for concentric grinding by the simple chucking fixture illustrated.

The body may be made of machine steel, pack hardened and ground on the I.D., back and inside face. It may be machined for mounting on face place or spindle nose adapter, as desired. The collet is made of tool steel, spring tempered, with O.D. and I.D. respectively ground to fit the I.D. of the body and the O.D. of the workpiece. Avoid sharp corners.

To operate, the part is placed in the collet, which is then closed by tightening the closing screw (3), thus springing the collet against the work. While the part shown has a large center hole which permits access to the screw, for tightening with a wrench, it may be desired to chuck a part without a center hole. In such case the closing may be effected by using a screw of the same pitch and diameter as the thread of the draw-in bar.

Merle L. Deckard
Detroit Chapter, ASTE

Means To Connect Springs



Spring retainers, for rollers, may be concealed by grooving as shown. (Kasper)

A roller assembly, shown in two views at A and B, required that the shaft turn with the roller, and that the periphery of the latter be free of any holes or any other breaks in the surface. As it was necessary that the roller fit closely between its supports, this raised the problem of how to attach it to the shaft. The illustrations show the method used.

Referring to C, which is a partial sectional view of the roller, one end is counterbored and then undercut with a half-round annular groove. A spring is inserted into the groove, as shown at D, which is a sectional view through X-X, in view A. The diameter of the coil of the spring is slightly larger than the diameter of the groove, so that the spring will grip tightly on the bottom of the groove.

The tail, or straight end of the spring fits into a groove in the shaft, as shown at D. At assembly, the spring is placed in the roller, which is then located between its supports, and the shaft is pushed through until the tail of the spring snaps into the groove in the shaft.

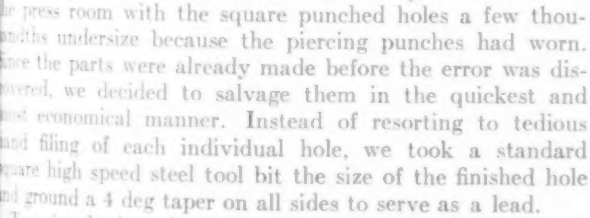
L. Kasper.
Philadelphia, Pa.

Tool Bit Enlarges Holes

Recently, in our plant, several hundred parts came from the press room with the square punched holes a few thousandths undersize because the piercing punches had worn. Since the parts were already made before the error was discovered, we decided to salvage them in the quickest and most economical manner. Instead of resorting to tedious hand filing of each individual hole, we took a standard square high speed steel tool bit the size of the finished hole and ground a 4 deg taper on all sides to serve as a lead.

Tapering both ends enabled the operator to use the bit from either end and also facilitated handling. We placed the pieces in an arbor press, dipped the tool bit in lard oil to reduce friction, and pressed it through the hole. Surprisingly, the holes opened up enough to permit the mating part to enter, and the pieces were salvaged at a minimum of cost.

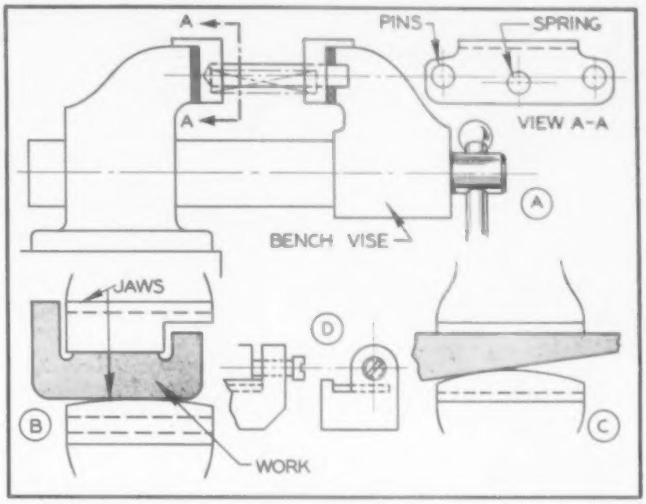
Robert Ivers, Racine Wis.



A "broach", made from a tool bit, can be used to resize punched holes.

Holding Loose Vise Jaws

Occasional use of false jaws, for machinists' or wood working vises can be simplified by holding the jaws apart by means of compression springs, as shown in Sketch A. To keep the work from bearing on the springs—and also to keep it from dropping through—pins can be pressed into one jaw and guided in the other through clearance holes. The top surface of the pins should be above the springs, as shown in view A-A.



False vise jaws may be retained by means of springs or screws as suggested by the several sketches.

Special jaws to hold irregular-shaped, stepped or shouldered work may be provided as suggested by Sketch B. In this case, one jaw is radiused for a more solid pressure against the work. Tapered work may also be held between one straight-face and a mating rounded jaw, work pressure being against the straight jaw, as shown by Sketch C.

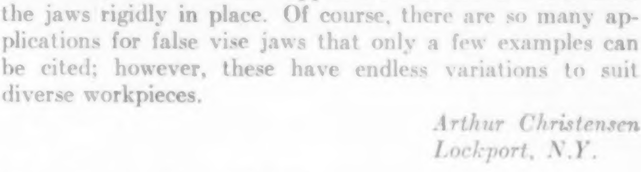
Yet another method of holding false jaws in place is suggested by Sketch D. Here, the jaws have ears or lugs on both ends, and these are tapped for set screws which hold the jaws rigidly in place. Of course, there are so many applications for false vise jaws that only a few examples can be cited; however, these have endless variations to suit diverse workpieces.

Arthur Christensen
Lockport, N.Y.

To Extend a Drill

When it is necessary to extend a drill, and a welder is not available, the following simple method will serve:

Take a length of drill rod of approximately the same size and drill a hole in one end, depth to be proportionate to the diameter of the drill used. At the end of the hole, file or mill a flat down to the center line of the rod.



Drills may be exended by inserting in a drilled section of drill rod, and "keyed" as shown.

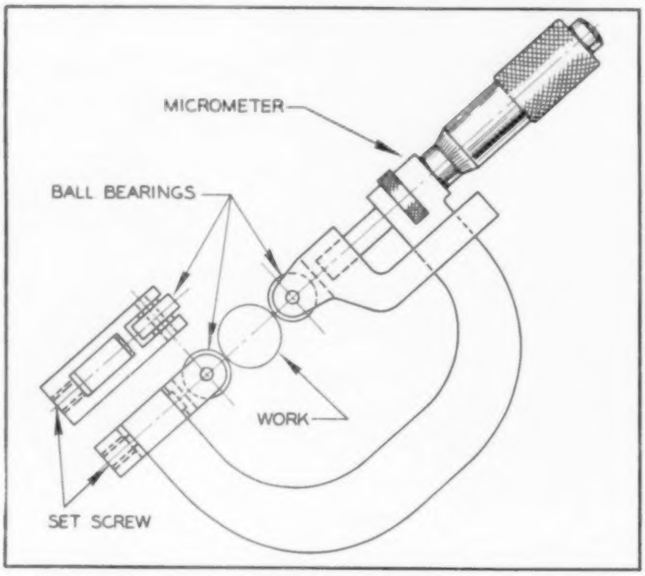
Next, grind a flat on the shank end of the drill, and insert so that the flatted portions telescope. Should there be looseness or play that might cause the drill to fall out, it may be sweated into place. Should it be desired to make a deep hole drill, the shank extension should be slightly smaller than the body size of the drill, which should have the shank end turned down as shown in the sketch.

George Hull,
Detroit Chapter, ASTE

Ball Bearing Micrometers

What I would like to see is ball bearings set into the anvil and spindle of micrometer calipers so that a workpiece being turned in a lathe can be checked without recurrently stopping the lathe to take measurements. The ball bearings would be free to turn with the work without grabbing or damage to measuring surfaces.

Arnold Saunders
Schenectady, N.Y.



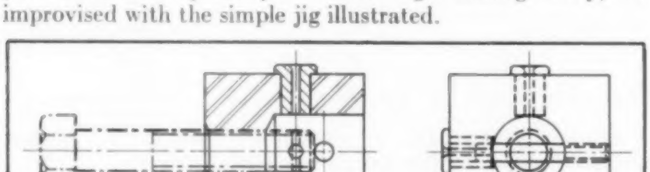
Ball bearings, mounted on a micrometer, would permit measuring of turned stock without stopping the lathe.

At least, the idea has the merit of sheer novelty and, as a time saver has the further merit of being practical. Perhaps some of our makers of measuring instruments can expand on the idea and produce a practical tool embodying the suggested principles.

The Gadget Editor

Inexpensive Tumble Jig

A short-run job called for two cotter pin holes to be cross drilled in some $\frac{1}{2}$ in. dia x 3 in. long bolts. Since the production run was too small to warrant an expensive drill jig, yet of sufficient quantity to make single drilling costly, we improvised with the simple jig illustrated.



Cross holes in bolts, screws and pins may be drilled with a simple tumble jig of the type shown. (Isetts)

This jig, which took only a short time to construct, using only a drill press, consisted essentially of a sawed-off block of 2 in. square cold rolled steel. This was centrally drilled and tapped for the threaded portions of the bolts, with the opposite end opened to 1 inch to provide chip clearance.

Drill bushings were then pressed into previously drilled and reamed holes, as shown, and opposite these were drilled clearance holes. A standard dowel pin, pressed in, served as a stop. The tapped hole was made loose fit, for easy loading and removal although, to prevent the bolts from turning, they were slightly wrench tightened before drilling. The jig illustrated is drawn to scale for the bolt in question; however, the principle can be applied to any similar job.

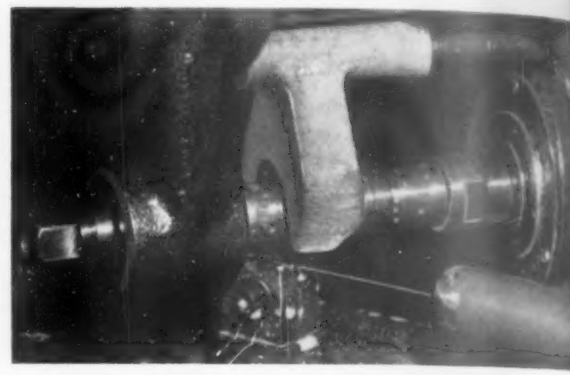
I. Rogers,
Racine, Wis.

Guard for Milling Cutter

When arrangement or operating conditions permit, ideal machine guard is one designed so that either machine or one or more of its elements cannot function without it. A guard of this type is illustrated herewith.

This guard partially covers a milling cutter and is secured to the coolant feep pipe, shown just under the overhanging arm. Since the coolant flows through the guard and onto the cutter, it not only confines spatter but also protects the operator. Removal of the guard will naturally prevent the coolant from reaching either the cutter or the work.

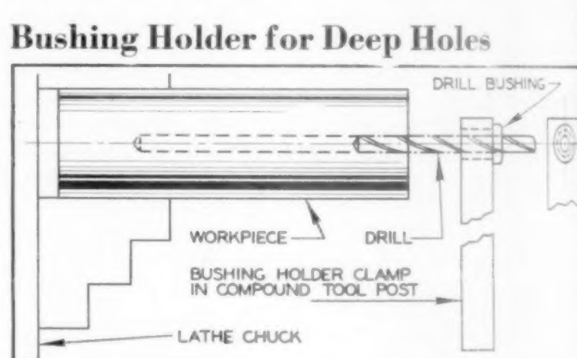
E. Guilbert
Chicago, Ill.



A coolant feed pipe, connected to the cutter guard, as shown, protects the operator and prevents coolant spatter. (Guilbert)

Editor's note: This guard, which was designed by Mr. Guilbert, Safety Director at Avildsen Tools & Machines, Inc., was photographed for use by the National Safety Council in a safety film.

Bushing Holder for Deep Holes



A "bushing plate" held in the lathe tool post, will support a drill and prevent weaving.

When drilling deep holes of small diameters that require some degree of accuracy in a lathe, the drill will weave or break if some method of support is not provided. Shown is an inexpensive holder that can be quickly made up to support the drill while advancing it into the work.

A flat piece of cold-rolled is reamed to a press fit, in one end, to receive a standard drill bushing. In use, the holder is clamped in the tool post on the lathe compound. The carriage is advanced so that the bushing is close to the end of the work. The tailstock, containing the drill, is advanced and the drill passes through the bushing before it contacts the work, thus providing a rigid support.

Roger Isetts
Kenosha, Wis.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 per each item.

Newly-elected ASTE officers take their oaths from Past President W. H. Smila during annual banquet at Philadelphia. From left: H. L. Tigges, president; J. J. Demuth, 1st vice-president; H. E. Collins, 2nd vice-president; R. F. Waindle, 3rd vice-president; W. B. McClellan, secretary; G. A. Goodwin, treasurer; and W. A. Thomas, assistant secretary-treasurer. Seated: Colonel Sidney F. Mashbir, guest speaker; R. B. Douglas, retiring president; and H. E. Conrad, executive secretary.

Tigges Elected President at Philadelphia, Research Fund Set Up During Convention

Chicago Wins '52 Exposition, New York to be Host for March '51 Meeting

FOR ITS 1950 president the American Society of Tool Engineers has elected a man whose scope of tool engineering has professional, administrative, international, and military aspects.

Herbert L. Tigges, executive vice-president of Baker Bros., Toledo, Ohio, was chosen to head the Society during the annual meeting of the board of directors at Philadelphia, April 12. The meeting occurred during the 18th annual ASTE convention and Tool Engineers Industrial Cost-Cutting Exposition at Convention Hall and Commercial Museum, April 10-14.

Heads National Emergency Planning

For two years Mr. Tigges has been an advisor and consultant to the Production Manufacturing Div. of the National Security Resources Board at Washington. In this capacity he directs mobilization planning activities of the machine tool section. Recently he addressed a group of Armed Services reserve officers on this subject during the Second Annual Economic and Industrial Conference at the Brooklyn Navy Yard. The two-week conference was sponsored by the Commandant of the Third Naval District.

Mr. Tigges is a director of the Amtea Corp., New York City, which handles sales of machine tools to Latin and South American countries for a number of U.S. manufacturers. A former director of the National Machine Tool Builders' Association, he has also directed its Sales and Service Committee.

Active in Home Town Organizations

In his native Toledo, the new ASTE president heads the Sales Executives Club, and serves on the Foreign Trade Committee of the Chamber of Commerce.

Mr. Tigges succeeds Robert B. Douglas, president, Godscroft Industries, Ltd., Montreal, Que.

Stepping into Mr. Tigges' former post as first vice-president is J. J. Demuth, general superintendent, Sligo, Inc., St. Louis, Mo. Mr. Demuth was second vice-president during the 1949-50 term. Harold E. Collins, chief production engineer, Hughes Tool Co., Houston, Tex., and Roger F. Waindle, general manager, Industrial Products Div., Elgin National Watch Co., Aurora, Ill., both Society directors, were elected second and third vice-president, respectively.

W. B. McClellan, engineer at Gairing Tool Co., Detroit, and George A. Goodwin, chief process engineer, Master Electric Co., Dayton, Ohio, were re-elected national secretary and national treasurer, respectively. W. A. Thomas, superintendent of tool engineering, Ford Motor Co. of Canada, Ltd., Windsor, Ont., is assistant secretary-treasurer. Harry E. Conrad, continues as executive secretary at the Detroit headquarters.

The officers were installed during the annual banquet at the Bellevue-Stratford Hotel, April 13.

Four New Directors Named

New directors to take office at the fall meeting were elected by the house of delegates as follows: Joseph T. Crosby,

vice-president and sales manager, The Lapointe Machine Tool Co., Hudson, Mass.; E. W. Ernst, superintendent of Punching Tool and Die Div., General Electric Co., Schenectady, N. Y.; Fred J. Schmitt, director of sales, D. A. Stuart Oil Co., Chicago, Ill.; and B. J. Hazewinkel, L. S. Starrett Co. representative, Denver, Colo.

Re-elected were: H. L. Tigges, J. J. Demuth, Leslie B. Bellamy, branch manager, Sterling Grinding Wheel Div., Cleveland Quarries, Detroit; T. J. Donovan, Jr., president, Donovan Co., Philadelphia; V. H. Ericson, president and sales manager, Johnson deVou, Inc., Worcester, Mass.; and A. D. Lewis, owner and manager, Art Lewis Production Equipment Co., Glendale, Calif.

R. B. Douglas, retiring president, serves on the board until the 1951 annual meeting at New York City, March 15-17, 1951.

To Consider Regional Meetings

While there will be no national convention this fall, the board and national committees will hold a semi-annual meeting at Detroit in October. The board instructed the National Program Committee to continue its study on regional meetings and to make definite recommendations.

Chicago made a successful bid for the 1952 Tool Engineers Exposition. The next Society show is scheduled for that city, March 17-21. This announcement prompted several exhibitors at the Philadelphia exposition to contract for double their 1950 space.

Research Foundation Voted

The directors appropriated $25,000 to establish a foundation for basic production research. President Tigges has appointed A. M. Sargent, president, Pioneer Engineering and Manufacturing Co., Detroit, to formulate plans for its operation.

On Mr. Sargent's committee are: W. H. Smila, master mechanic, Plymouth Motor Div., Chrysler Corp., Detroit; Professor O. W. Boston of the University of Michigan, and National Education Chairman J. N. Edmondson of Ohio State University. Frank W. Wilson, technical director of the Society, will work with this group in determining and organizing the foundation's activities.

Accepts $25,000 Scholarship Fund

The board also accepted a $25,000 fund, offered by an unnamed Chicago concern, to finance tool engineering scholarships in the state of Illinois.

All ASTE building fund participation certificates reaching their first anniversary between now and October will be redeemed, the board voted. The 10-year certificates to aid the financing of the organization's new headquarters building were issued subject to retirement after their first anniversary.

A complete report of the Philadelphia convention and exposition will appear in the June issue of *ASTE News*.

Kraus Demonstrates Mechanized Parts Feed

Rochester, N.Y.—A sample hopper feeding mechanism, operated during their March 6 meeting, demonstrated convincingly for Rochester members the value of "Mechanization of Parts Handling."

This subject was discussed by Charles E. Kraus, president, Kraus Design, Inc., Mr. Kraus' paper, which he later presented at the ASTE convention in Philadelphia, appears in this issue of *The Tool Engineer*.

Before the technical session William Gordon, retiring chairman, commended the chapter board of directors for their cooperation and efforts during the year. In appreciation of five years' service as chapter secretary, Mr. Gordon presented a wrist watch to Robert Barnett.

Herbert O. Simon of the Advisory Committee swore in officers-elect: Emmett W. Moore, chairman; James O. Horne, first vice-chairman; Norman Fowler, secretary; George E. Codd, treasurer; W. R. Gordon, delegate; and Mr. Moore, alternate.

William Auer, Karl A. Schmidt and John Lawrence were installed as members of the Executive Board. Two other board members, Charles Bonfiglio and Ernest Schramm; Charles DeMartin, second vice-chairman; and Donald Kohler, third vice-chairman, were not present for the ceremony.

Mr. Horne, who is also a member of the National Program Committee, introduced the technical speaker.

Among guests welcomed by Mr. Gordon were Prof. R. S. Raue of the New York State Agricultural and Technical Institute at Alfred and 14 of his students. This group traveled 60 miles to attend the meeting.

Edward A. Schwartz of the mechanical department, Rochester Institute of Technology, received the chapter's annual scholarship, February 6, when the members met at the institute to elect chapter officers.

Edward A. Schwartz (left), Rochester Institute of Technology student, receives annual scholarship sponsored by Rochester chapter from Chairman William Gordon.

Chairman Gordon presented the award, reserved for the most deserving freshman enrolled in the tool engineering course.

Following election and other chapter business, two non-technical films were shown.

Rockwell Now V. P.

Hartford, Conn.—Dudley W. Rockwell, a charter member of Boston chapter, was recently elected vice-president of The Stanley P. Rockwell Co. of Hartford.

Mr. Rockwell has been associated with this company as a sales engineer since his graduation from Yale University Sheffield Scientific School in 1935.

Other News in This Issue

Chapter listings include member as well as meeting news.

Top: V. H. Ericson (right), national director from Worcester, inducts Greater New York officers. From left: Carl Kertesz, chm.; Joseph Schneider, 1st v.-chm.; Edward Galvin, 2nd v.-chm.; Hugo Aglietti, treas.; and Virginia Martino, secy. Below: New Dayton officers are from left, seated: Lawrence McAfee, 2nd v. chm.; Richard Blair, secy.; William Lawrence, treas.; standing: Gordon Letsche, alternate; Robert Armstrong, 1st v.-chm.; Russell Miller, chm.; and National Treasurer G. A. Goodwin, installing officer.

Automatic Transmission Is High Precision Job

Flint, Mich.—Buick Motor Div. of General Motors Corp. was host to Saginaw Valley chapter recently for a tour of the Dynaflow Division.

As they viewed each manufacturing operation, the engineers were impressed with the intricate machining performed on the Dynaflow transmission. This transmission presents one of the most exacting production jobs ever undertaken by an automobile builder. It must be built not only with unerring precision of alignment, but with flat, fine-finish gasket faces as well.

All oil pressure lines are built in and require fits and tolerances considered impossible only a few years ago. During part of the operating cycle, pressure is 180 psi and the entire aluminum die casting must withstand such pressure without leakage. These parts must have machined faces and bores free from porosity. Such finishing operations as facing large areas, boring, grooving, and step boring are done on precision machines.

On the reaction flange, which is 18 in. long and about one inch thick, total limit of flatness and parallelism is held to 0.0005 in. over the entire surface. This is achieved by heat-stabilizing the rough casting at 400 deg for $5\frac{1}{2}$ hours, then machining the part in one pass on each side in a boring machine.

Dinner and a business meeting preceded the plant tour, with Chairman Harold Devore presiding. Lionel Kitchen, Ralph Cook and Norman Snyder were elected a Nominating Committee.

Details Applications Of Multi-Slide Presses

Dayton, Ohio—W. P. Powers, secretary of U. S. Tool Co., Inc., East Orange, N. J., detailed uses and possibilities of Multi-Slide presses at the March meeting of Dayton chapter.

Mr. Powers accompanied his discussion with films and slides. In addition he and his associates, Albert Melnick, chief engineer, and B. O. Bagley, sales engineer, explained the steps necessary to produce the sample parts displayed.

Before the technical program, George A. Goodwin, national treasurer, installed the following chapter officers for the coming year: C. R. Miller, chairman; R. J. Armstrong, first vice-chairman; Lawrence McAfee, second vice-chairman; Richard Blair, secretary; and William Lawrence, treasurer. Gordon Letsche, retiring chairman, is now alternate delegate. Herman Poock, elected delegate, was unable to be present for the installation.

Some 40 members entering the chapter during the past year received membership pins and certificates at this meeting. Lawrence McAfee, the outgoing membership chairman, made the presentation.

Two Women Win Offices At Greater New York

New York City—For the first time in Greater New York chapter history, a woman has been elected to a chapter office and another has been named to a committee chairmanship.

During an installation dinner, March 7, at Hotel New Yorker, V. H. Ericson, national director from Worcester, Mass., swore in petite Virginia Martino as chapter secretary, along with Carl Kertesz, chairman; Joseph Schneider, first vice-chairman; Edward Galvin, second vice-chairman; and Hugo Aglietti, treasurer.

The other woman office holder is Idalyn Cohen, publicity chairman. Miss Cohen is a draftswoman at Babcock & Wilcox Co., Brooklyn, and Miss Martino is a checker at Kollmorgen Optical Corp., also of Brooklyn.

After the ceremony Arthur Kugler, mechanical engineer, Technical Sales Div., Air Reduction Sales Co., New York, talked on "Welding and Cutting." Mr. Kugler showed a Kodachrome film, "No Keener Blade," to illustrate his lecture. An extensive question and answer period followed.

* * *

On March 14 a group of chapter officers and members visited Mid-Hudson chapter, as reported in the Poughkeepsie group's installation story.

Claims 'Straight' Oils Excel as Cutting Fluids

Elmira, N. Y.—Sharper temperature gradient, uniformity, higher viscosity, and better lubrication make "straight" oils superior to water soluble coolants as cutting fluids, according to W. H. Oldacre of D. A. Stuart Oil Co., Chicago.

Mr. Oldacre stressed these points while lecturing on "Cutting Fluids and Tool Engineering," before a meeting of Elmira chapter, February 6. The speaker used slides to illustrate various theories of chip formation. He explained where coolants are necessary and most effective.

Elects Woman Secretary

During the meeting the chapter elected the following officers for 1950-51: Mads H. Kristensen, chairman; Asa C. Bement, first vice-chairman; Henry G. LeMaire, second vice-chairman; Sara E. Swan, secretary; Edward Ballard, treasurer; Patrick G. Pecoraro, delegate; and Ray Rauscher, alternate.

Miss Swan, who was education chairman last year, is the chapter's first woman officer.

* * *

The chapter joined with ASM for another recent meeting, attended by 60 members of the two societies.

Paul G. Nelson of The Budd Co. discussed "Deep Drawing of Low Carbon Sheet and Strip Steel." Aided by slides he pointed out that tensile strength tests are preferred for determining properties of low carbon steels for deep drawing. Tool designers, he added, should design dies to utilize the ductility of steel.

Calls Improved Methods 'Organized Common Sense'

St. Catharines, Ont. — Preaching the gospel of waste elimination in production, W. L. Sandham, standards manager of Hayes Steel Co., told Niagara District chapter, March 2, about improved methods of turning out better goods at lower cost and with less effort.

Improved methods are simply "the organized use of common sense," Mr. Sandham told the meeting.

A questioning, fact-finding attitude must be used to survey and improve any job process. "Write it down," he advised, when looking over a job to see how it is done, before trying to improve it.

"Industry's greatest unused asset is the ingenuity of its people," said Mr. Sandham. "Let everybody get into the act."

Search for a better method of doing a job implies no criticism of the present way, he said. But there is always a better way.

Newly-elected chapter officers were installed by Harry Whitehall of Hespeler, a member of the National Membership Committee.

Those inducted were: C. G. Bradford, chairman; Fred Dunn, first vice-chairman; Robert Watts, second vice-chairman; James Caiger, treasurer; and John Marchand, secretary.

Douglas Wright, charter chairman of the chapter and a member of the National Education Committee, revealed that plans are being considered for the formation of a research foundation to study tool engineering problems.

New Haven Names Radecki Chairman

New Haven, Conn.—M. J. Radecki took over the chairmanship of New Haven chapter in a ceremony conducted by Past Chairman Alton Pollard, March 9. The installation was held during a dinner meeting at Fitzgerald's Restaurant.

Other officers installed by Mr. Pollard are: David J. Matthewson, first vice-chairman; John H. Alton, second vice-chairman; Bernard W. Didsbury, secretary; Emanuel Lull, treasurer; and Gerard P. Schoeller, delegate.

Frank W. Gilbert, technical chairman, introduced Kenneth N. Macomber, chief service engineer of The Lapointe Machine Tool Co., Hudson, Mass. Mr. Macomber related the development of broaching, including the principles applied in current practice. He showed two sound films to the audience of 50 members and guests.

* * *

Charles W. Ohse, president, The New England Die Casting Co., Inc., West Haven, addressed the February 9 meeting. His subject was "Die Casting and Dies." A pioneer in this field, Mr. Ohse used a variety of sample castings to demonstrate problems encountered in connection with this process.

The speaker talked extemporaneously and answered questions throughout his discussion.

New chapter officers were elected during a business meeting.

Man Is Costly Tool, Says Material Handling Expert

Pittsburgh, Pa.—Man is an expensive tool. He has an eight-hour rating of about 1/4 hp. This is equivalent to the heat value to 1/3 pint of fuel oil. In contrast to the modern, internal combustion engine, fuel for a man runs as high as $1 per pound for solid forms and $6 per 4/5 quart for liquids.

C. C. Whiteford, manager, material handling engineering, Ford Motor Co., made these comparisons during an address, "Material Handling Engineering and Operations as Related to Machine Tool Design Engineering," before Pittsburgh chapter, March 3.

As a power plant, Mr. Whiteford went on, a man weighs about 700 lb. per hp.

Top: National Membership Committeeman Harry H. Whitehall of Galt, Ont., hands the Niagara District gavel to C. G. Bradford, chairman, after installing chapter officers. From left: James Caiger, treasurer; F. W. Dunn, first vice-chairman; Mr. Whitehall and Mr. Bradford, Robert Watts, second vice-chairman; and John Marchand, secretary. Center: Frank Boyd, retiring chairman of Pittsburgh chapter, swears in new administration. Officers from left: G. C. Wood, chairman; W. J. Bickmore, first vice-chairman; W. W. Walters, treasurer; and F. W. Hennig, secretary. Bottom: Oaths are administered to New Haven officers by Alton Pollard (right) a past chairman. Officers, from left: Gerard Schoeller, delegate; Emanuel Lull, treasurer; Bernard Didsbury, secretary; John Alton, second vice-chairman; David Matthewson, first vice-chairman; and Michael Radecki, chairman.

Although he has many qualities considered desirable in a tool, it is man's brain control that makes him indispensable. Applied to material handling processing methods and equipment, as adapted to machine tools, this outstanding characteristic can increase production by utilizing maximum machine capacity.

While production machines, designs and techniques have been so highly developed that further substantial savings are unlikely, mechanization of material handling still offers a means to considerably lowered costs, he asserted.

Progress in efficient material handling does not wait upon technical advances as it does upon the development of a competent handling organization, the speaker observed.

In a business meeting, preceding the technical session, annual reports were read and the following officers were installed: G. C. Wood, chairman; W. J. Bickmore, first vice-chairman; F. P. Turk, second vice-chairman; Fred Hennig, secretary; W. W. Walter, treasurer; F. T. Boyd, delegate; and G. C. Wood, alternate.

Ross C. Cibella of the Pittsburgh Chamber of Commerce brought a subject of vital interest to the members when he discussed "Pittsburgh Meets the Challenge" at their February 8 meeting.

Mr. Ross told the story of the Pittsburgh of tomorrow, showing the contemplated improvements in pictures and slides.

Past chairmen present at the meeting included: James Wiley, W. B. Peirce, William Owen, Gardner Young, D. L. Bardes, C. J. Brickner, William Schott and W. L. Risser. J. R. Weaver, G. P. Grace, R. W. Ford and P. H. Magnus, also former chairmen, sent regrets at being unable to attend the dinner meeting.

Top: W. J. Byrum of the Indiana Department of Conservation tells Evansville tool engineers and their women guests what is being done to conserve natural resources in their state. Below: A. S. Jameson (left) of International Harvester Co. lectured on tool steels at another chapter meeting. Joseph Novak of the local I-H plant was program chairman.

Nashville Installation Elevates Incumbents

Nashville, Tenn.—Installation of Nashville chapter officers took place at a dinner meeting at the Andrew Jackson Hotel.

The incoming chapter executives are: Fred Wright, chapter chairman; Scobey Rogers, first vice-chairman; John Palmer, second vice-chairman; John Gipson, secretary; and W. A. Thornberry, treasurer. All offices except Mr. Thornberry's were filled by promotion or re-election.

After the installation Charles R. Morten from the Precision Welder & Machine Co., Cincinnati, Ohio, discussed "Resistance Welding Applications and Practices." A General Electric sound film, "This Is Resistance Welding," accompanied the talk. Following the film Mr. Morten answered questions from the group, and presented two sample boards of products fabricated by resistance welding.

One guest submitted an application for membership and several others indicated interest in joining the Society.

Actual working units of magnetic and acoustic mines highlighted the chapter's February 24 meeting.

W. F. Akin of Buford Bros., Inc., used the mine mechanisms to illustrate a talk on "Methods of Initiating Explosives, Mines, Bombs, Torpedoes, and Rockets." The mine parts came from explosive devices which Mr. Akin had personally recovered in deep-sea diving while serving as a lieutenant commander in the U. S. Navy.

Officers for the coming year were elected during a business meeting preceding the technical program.

Metallurgist Relates I-H Steel Practices

Evansville, Ind. — Approximately 90 members and guests of Evansville chapter met February 13 at the local plant of International Harvester Co.

The meeting opened with dinner in the company cafeteria and featured an informative talk by A. S. Jameson, supervisor of the firm's metallurgical research laboratories at Chicago. His talk, "Selection, Specifications and Analysis of Tool Steels," was accompanied by slides illustrating I-H methods of identifying and selecting tool steels to meet a predetermined requirement.

Program chairman for the meeting was Joseph Novak, assistant mechanical engineer at International Harvester's Evansville plant.

* * *

A non-technical program highlighted the chapter's annual ladies night, held lately at the Alpine House. Some 50 couples attended the dinner party.

W. J. Byrum of the Indiana Department of Conservation presented two motion pictures, "Our State Parks" and "Rivers," and talked on "Conservation of Natural Resources and Wildlife."

In addition to the ladies, special guests included the Vanderburgh County and Indiana game wardens.

The attendance prize, an ASTE Handbook, was won by Harley Lichtenberger a student member at Evansville College.

Owen Installs Officers, Kurtz Appoints Chairman

Muncie, Ind.—Halsey F. Owen, ASTE third vice-president, and Purdue professor, was a guest at Muncie chapter, March 7.

Professor Owen administered the oath of office to: Arthur F. Kurtz, chairman; Leslie Mendenhall, first vice-chairman; L. Lavon Deane, second vice-chairman; Melville R. Troyer, secretary; and N. Francis Wilson, treasurer.

Chairman Kurtz appointed as committee chairmen: Norman Hines, public relations; Claude P. Root, editorial; Irvin L. Morrow, education; Paul Grow, program; Charles Marker, reception; Lester F. Lotz, standards; Robert Weimer, constitution and by-laws; and William Hayes, membership.

Following the installation Harold T. Amrine, professor of industrial engineering at Purdue, lectured on "More Production Through Motion Study."

Plastic-like Compound Used in Aluminum Draws

Montreal, Que.—On March 9 Alexander McKinney-Rice of H. L. Blachford Co. Ltd., addressed Montreal chapter, on "Tool Lubricants and Coolants."

Mr. McKinney-Rice, a chapter member, outlined the progress in this field from a few decades ago when lard oil was practically the only agent used. Higher production and tougher alloys, coupled with the high cost of lard oil, compelled chemists to search for cheaper, quality substitutes.

Sulphurized oils brought higher production runs. Compounds with low percentages of sulphur are preferred since brass and copper are stained by this liquid.

Water Soluble Coolants Economical

Mr. McKinney discussed water soluble compounds, with special emphasis on their economy. Even diluted with as much as 30 times their volume of water, these compounds retain their emulsive quality and form a film under high pressure, he said. The absence of alcohol and rancidity and the stainfree working of red metals also were stressed.

Water soluble grinding compounds with detergents were recommended for their resistance to pressure and for increased wheel life, as well as for the appearance of cleanliness they give both work and machine.

Drawing compounds free from minerals are used for parts requiring vitreous enamel finishes. Multi-draws on aluminum parts may be accomplished by one application of a plasticlike compound. This forms a dry film which may readily be removed with a hot water spray.

Dual and triple purpose lubricants also were discussed. Mr. McKinney-Rice noted the economy resulting from the use of proper compounds and recommended discretion and diligence in their application.

The speaker was introduced by T. C. Hill and thanked by C. J. McDowell.

* * *

Lacking only a cap and gown, T. J. Donovan, Jr., of Philadelphia gave a creditable rendition of the famous "Dr. I. Q." when he presented his well-known quiz program to about 75 Montreal members and guests at a meeting February 9 in Canadian Legion Hall.

Equipped with a roving mike, Gerald Rogers acted the assistant looking for the proverbial "lady in the balcony" while the Doctor kept the audience in good humor by interspersing his serious questions with lighter ones.

Mr. Donovan's questions pertained to tool design, punch and die setup, tool steels, and heat treatment. He proved that even in these fields the experts have to think twice.

As prizes for correct answers, Mr. Donovan distributed U. S. silver dollars in embossed leather containers.

M. A. Cote presented Mr. Donovan and Samuel Pedvis expressed the chapter's appreciation of his program. During the meeting, Mr. Pedvis was elected chapter chairman.

Johns Hopkins Student Wins T.E. Scholarship

Baltimore, Md.—A Johns Hopkins University student was awarded the Baltimore chapter scholarship at the members' February 1 dinner meeting at the Engineers Club.

In recognition of George E. Wenzel's continued efforts and high grades, Andrew Jones, chapter chairman, presented a check to the engineering student for his second semester studies at the university.

After the award presentation, officer candidates were submitted by the Nominating Committee and elected by the membership. They are: Robert D. Brickett, chairman; Anthony Taormina, first vice-chairman; Hans H. Schafer,

Andrew Jones (right), Baltimore chapter chairman, congratulates George E. Wenzel, Johns Hopkins University senior, on winning the Maryland ASTE group's scholarship.

second vice-chairman; Charles Janus, secretary; Herbert Middlestadt, treasurer; Andrew Jones, delegate; and Thomas F. Burke, alternate.

The coffee talk inaugurated a member participation program, paralleling the chapter's manufacturers participation programs. First Vice-Chairman Harold G. Suiter, general manager of Chase Engineering and Manufacturing Co., spoke on the development of the magnetic tape recorder.

E. A. Brezina, chief tool engineer of Cleveland Twist Drill Co., followed with an instructive discourse on the art of reaming. A film, demonstrating reaming procedure and the protection of reamers, highlighted Mr. Brezina's discussion.

Before closing his address, the speaker assisted several members of the audience in solving drilling and reaming problems.

Refreshments were served later to approximately 75 members and guests.

Kunath Heads Tool Firm

Providence, R.I.—Fred W. Kunath was elected president of the Anchor Tool Die Co., at a recent meeting of the board of directors. Mr. Kunath came to Providence from the Mid-West about ten years ago. For the past six years has served as chief engineer at Anchor.

Program chairman of Little Rhody chapter last year, he was elected chapter secretary for 1950-51.

Student Engineers Quiz Education Forum Experts

Philadelphia, Pa.—A "Stump the Experts" program was sponsored by the Education Committee of Philadelphia chapter, at Drexel Institute of Technology, March 8. Attending were seniors in mechanical engineering from the institute, the University of Pennsylvania, Villanova and Swarthmore colleges, and the class in tool and die design at Spring Garden Institute.

Educators, Executives on the Spot

Kenneth W. Riddle, first vice-chairman-elect, introduced Dean Howard W. Gross, education chairman.

After defining tool engineering and the profession's scope in industry, Dean Gross presented a panel of experts consisting of: Prof. J. H. Billings, head of mechanical engineering at Drexel; Fred L. Creager, model shop superintendent, Radio Corp. of America; Clarence Hopper, production manager, A.C.F. Brill Co.; John Lawrence, vice-president, SKF Industries; L. S. Paulsen, superintendent of manufacturing, Link-Belt Co.; William Reeser, mechanical engineering department, Swarthmore College; and J. R. Weaver, vice-president, Baldwin Locomotive Works.

Prof. William Stevens of Drexel and Emil Kitzman, chapter chairman, served as judges to determine the rating of each question asked by the students. The panel answered all queries and advised the students concerning tool engineering and its prospects.

Prizes donated by chapter members were awarded for the best questions. At the conclusion of the forum the Drexel students served refreshments.

T. E. Leads to Top

"Many leaders in industry have advanced to their high positions through tool engineering experience," J. C. Whitesell of The Budd Co., told a student meeting at the University of Pennsylvania on February 15.

Mr. Whitesell, superintendent of plant engineering at the Red Lion plant, stressed advantages of tool engineering as a profession and as an avenue of advancement for young men with formal training, who have acquired ability to analyze manufacturing problems. He outlined a tool engineer's work from the original estimate proposal to completion of a manufacturing installation, commenting on problems entailed.

In conclusion Mr. Whitesell described the tool engineer's role in the building of stainless steel railway cars and truck trailer body components at The Budd Co.

A question and answer period followed his talk. Mr. Whitesell displayed drawings and work samples used to illustrate his lecture.

Sponsored by the chapter Education Committee, the meeting was attended by 65 engineering students from the schools represented at the March meeting.

Parts Packing Technique Noted at Ordnance Depot

Toledo, Ohio—Row after row of land and amphibious motor vehicles ready for instant use were viewed by some 50 Toledo chapter members and their guests during a recent bus tour through the yards of the Rossford Ordnance Depot.

In the auto repair departments vehicles are inspected and run through by production shop methods. A trip through a few of the warehouses emphasized the magnitude of material handling and storage problems. Machines and machine tools were stacked high and deep.

At the pre-packing department, machine parts are received in their normal wrapping, unwrapped, dipped in a heavy cleaning solution and regreased. Without being touched each part is rewrapped and returned to its original packing. The box is then wrapped, sealed with an outer wrapper and paraffin and given a final protective covering.

A large operations office houses a staff to do the paper work for scheduling, storing and inventorying.

After the tour refreshments were served in the Bachelor Officers' Club.

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At another late meeting H. L. Tigges, a chapter member who has since been elected ASTE president, talked on national activities of the Society and invited members to contribute technical articles to *The Tool Engineer*.

Dr. M. Eugene Merchant, senior research physicist, Cincinnati Milling Machine Co. and co-author of a section of the Tool Engineers Handbook, lectured on "Chip Formation, Friction, Finish."

Showing slides, he explained the three basic types of chips and the variable factors tending to produce them. Methods of controlling these factors, such as rake angle, condition of material being cut, and use of coolants were discussed. A film, "Physics of Metal Cutting," depicted a tool forming a chip and the effect of a coolant.

Fairfield Top Office Captured by Hogan

Bridgeport, Conn.—March 1 meeting of Fairfield County chapter was held at the Stratfield Hotel, with elected officers sworn in by A. Sidney Curry of Norwalk, a former chairman. Mr. Curry also presented a past chairman pin to Meredith W. Wilterdink, outgoing chairman.

The new officers are: Chairman, Thomas E. Hogan; first vice-chairman, Douglas F. Linsley; second vice-chairman, Mason B. Whiting; treasurer, Eugene W. Laistner; secretary, Richard Smith; delegate, Mr. Curry; and alternate, Mr. Wilterdink.

Chairman Hogan announced the following committee appointments: Program, Mr. Linsley; membership, Mr. Whiting; entertainment, Richard T. Holt; standards and technical, Sidney P. Harris; constitution and by-laws, Arthur F. Murray; public relations, Francis J. Billingsly; industrial relations, Philip R. Marsilius; editorial, Robert Rawstron; education, Robert Fitzgerald; registration of professional engineers, Mr. Curry.

William J. Connelly, assistant director of public relations, Bakelite Div. of Union Carbide and Chemical Corp., addressed the group on the subject, "Synthetic Plastics and Proper Perspective of Plastics." His knowledge of thermo-setting and thermo-plastic resins, their manufacture, fabrication and application went across to his audience in an interesting and humorous manner.

Cites Plastics as Light, Strong, Wear-Resistant

Winston-Salem, N. C.—Although laminated plastics weigh only about one-half as much as aluminum and one-sixth as much as steel, they are proportionately stronger than cast iron. They will not support vibration as steel does, but their impact resistance is greater.

These facts were brought out during a lecture by John C. Pitzer of the Formica Co., Cincinnati, O., before 60 members of Piedmont chapter. Mr. Pitzer was the technical speaker at a chapter dinner meeting held March 13 at Thacker's Restaurant, Charlotte.

Highly resistant to wear, laminated phenolics make good planer bedways, because they do not gall like metal. For best results from punching, according to Mr. Pitzer, the punch should have about 0.004 in. clearance regardless of material or whether material is being worked hot or cold.

After the technical talk and an open discussion, C. J. Rix, second vice-chairman, announced that the Executive Committee had set a goal of 125 members by June. Mr. Rix officially opened the campaign by asking each member to recruit another.

Guests of the evening were Faison Kuester and Clarence Kuester of Kuester Bros. Co., local Formica distributors.

In order to service the entire chapter area, the group has decided to rotate meetings between Winston-Salem, Charlotte and Greensboro.

New officers assume their posts at Richmond chapter after taking oath from Lowell B. Penland (right) a former chairman. From left: Carl Huth, second vice-chairman; H. B. Friberg, treasurer; Mervin Culbertson, chairman; Russell Culbertson, secretary; and Dezell Gibbs, first vice-chairman.

Morse Chosen Chairman By Worcester Members

Worcester, Mass.—Seventy-five members and guests of Worcester chapter were present for the installation of 1950-51 chapter officers. The ceremony took place at a dinner meeting held March 7 at Putnam & Thurston's Restaurant.

Frank W. Curtis of Springfield, a former Society president, swore in the following: Carroll L. Morse, chairman; Ralph A. Baker, first vice-chairman; Bernard D. Szarek, second vice-chairman; John E. Rotchford, secretary; E. R. Ljungquist, treasurer; Carl D. Schofield, delegate; and Thomas C. Bradford, alternate.

After the induction of new officers Arthur K. Phillippi, manufacturing engineer of Westinghouse Electric Corp., Springfield, lectured on "Controlled Atmosphere Furnace Brazing, Its Problems and Practice." An active question period followed.

On February 7 the chapter met jointly with the Quality Control Society and other Worcester engineering societies. The approximately 100 engineers attending the dinner meeting and technical session at Putnam & Thurston's included 70 members of the ASTE group.

Mayor Addresses Engineer Groups

Andrew B. Holmstrom, vice-president of Norton Co. and mayor of Worcester, was guest of honor. Mayor Holmstrom described his activities as chief executive of the city, his hopes for and confidence in the community's future.

Technical speaker was Warren R. Purcell, manager of quality control, Sylvania Electric Products, Salem. In discussing "The Scope of Quality Control," Mr. Purcell emphasized the importance of establishing standards, detecting deviations therefrom, and discovering the causes of such deviations.

Following his presentation Mr. Purcell conducted a question period. The engineers were stimulated and carried away new ideas on the possibilities of quality control.

Officers were elected during a business meeting of the ASTE members.

Culbertson, '50 Chairman Of Richmond Engineers

Richmond, Ind.—Mervin Culbertson was installed as chairman of Richmond chapter at a meeting held March 14.

Other officers inducted by Lowell B. Penland, a past chairman, included Dezell Gibbs, first vice-chairman; Carl Huth, second vice-chairman; Russell Culbertson, secretary; and H. B. Friberg, treasurer.

Following the installation ceremonies the engineers heard an educational talk by E. E. Opel, chief electrical engineer for the National Automatic Tool Co. Mr. Opel discussed uses of electronic tubes for controlling operating cycles on modern machine tools.

He illustrated his talk with motion pictures showing the complex requirements of modern machines and how the electrical engineer is solving their problems. A discussion period followed.

Paul Hermansdorfer, who was in charge of the meeting, was presented with a past chairman pin. Mr. Culbertson received the chairman pin and the gavel.

A dinner, attended by 52 members and guests, preceeded the meeting.

Evansville Entertained By Plastics Plant

Evansville, Ind.—Hoosier-Cardinal Corp. was host to approximately 60 Evansville members and their guests for a dinner meeting, March 13, at the company cafeteria.

After dinner H. C. McMillen, past chairman of Evansville and Dayton chapters and chairman of the National Finance Committee, installed the chapter's incoming officers. They are: W. V. Stippler, chairman; C. H. Thuman, first vice-chairman; Roman Wannemueller, second vice-chairman; Henry Pernicka, secretary; Paul Vierling, treasurer; Walter Schneider, delegate; and Herman Strauss, alternate.

Frank Curtis, chief product designer at Hoosier-Cardinal, presented the technical subject, "Plastics." Mr. Curtis also displayed samples of plastic products, such as chiller pans, clock bases, automobile accessories, refrigerator nameplates and interior parts.

Program chairman for the meeting was Richard Parmelee, production superintendent at the H-C plant.

Guests included six student members-elect from Evansville College.

Atomic Energy Engineer Is Inauguration Speaker

Erie, Pa.,—Approximately 80 members and guests of Erie chapter saw the newly-elected ASTE officers installed March 13.

Archie Weingard, retiring chairman, administered the oath of office to Stanley Sadoski, chairman; Robert Wilson, first vice-chairman; Joseph Halmi, second vice-chairman; Harry M. Rudd, secretary; Edward Norgren, treasurer.

Harold Hagle, program chairman, introduced R. G. Lorraine, a project head in the Knolls Atomic Power Laboratory.

Aided by slides Mr. Lorraine explained the three atomic fuels available for producing atomic power: Uranium 235 which occurs in nature, Plutonium 239 made synthetically, and Uranium 233 which is natural in minute amounts. The latter can be made artificially from thorium, a fairly common element.

Could Utilize Available Elements

Breeding, he stated, would make it possible to convert into fissionable fuels most of the uranium and thorium which can be mined. Mr. Lorraine reviewed data that has been released on reactors already built or planned. A question and answer period followed the lecture.

Chairman Weingard, introduced the coffee speaker, Robert Reed, assistant works manager at the Erie Works of General Electric Co., who spoke briefly on "Greater Production at a Lower Unit Cost Through Better Tooling."

Howard Wagner and Laurence Green of Sylvania Electric Co., Warren, were introduced as new members.

Among the guests were: Allen Davidson, Carl Olson, George Malcolm and George Runnel of Talon Inc., Meadville; Ross Millikin, O'Neal & Co.; Robert Wolf and Harry Jackson, Autoclave Engineering Co.; Richard Welsh, Ronald Bell, M. W. Metzner, Steward Ferrie and John Brightfelt, General Electric Co.; Edward Dahn, American Meter Co.; and Nathan Raybourn and his plastic mold design class from Behrend Center, Penn State College in Erie.

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Importance of quality control in manufacturing was impressed on chapter members who heard Roscoe C. Beyers, assistant to the director of quality control at Westinghouse Electric Corp., Pittsburgh, speak on this subject, February 7, at Gannon College. Mr. Beyers used slides and charts in presenting his lecture.

The 35 members attending the dinner meeting elected 1950 officers prior to the technical program.

Mr. Weingard introduced W. P. Hamilton, Talon, Inc., Meadville, and William Sedler, Swanson Tool Co., Erie, both new members of the chapter. He also presented the following guests: P. J. Addessi, Continental Rubber Works, James Burke, Lord Mfg. Co., Edward Jones, Louis Marks Co., Inc., Edward Schrock, G. E. Quality Control Div., and John Brightfelt, G. E. Locomotive and Car Equipment Div., all of Erie; J. A. Thompson, Reiff and Nestor, Buffalo, N. Y.; and Ralph Fritze, Hotpoint Quality Control, Edison G. E. Appliances Co., Chicago, Ill.

Top: Des Moines members wait for election results. Below: Dr. Harry B. Osborn, national membership chairman, inducts the successful candidates. From left: Dr. Osborn, Clyde Allen, first vice-chairman; John M. Speck, chairman; H. G. Ringgenberg, second vice-chairman; Loren Hallonquist, secretary; and Howard Campbell, treasurer.

Osborn Ushers in Officers During Des Moines Visit

Des Moines, Iowa—Dr. Harry B. Osborn, Jr. of Cleveland, ASTE national membership chairman, was an election night guest of Des Moines chapter. The dinner meeting, held February 15 at Hotel Kirkwood, was attended by 70 men.

After Walter F. Fox of the Nominating Committee had presented a slate of candidates, Dr. Osborn conducted the election, then installed the new officers. The 1950-51 chapter executives are: John M. Speck, chairman; Clyde Allen, first vice-chairman; H. G. Ringgenberg, second vice-chairman; Loren O. Hallonquist, secretary; and Howard E. Campbell, treasurer.

Dr. Osborn, who is technical director of Ohio Crankshaft Co., spoke briefly on ASTE membership, before lecturing on industrial applications of induction heating.

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Professor Rusinoff of the Illinois Institute of Technology was guest speaker at the new chapter's third meeting. He addressed an audience of 144 men on the subject of die design. The professor showed slides to illustrate points discussed.

During the evening E. C. Estabrooke of the American School presented information on study material available from correspondence schools that are helping industry.

Carbide, Tool Engineers Join in Panel Discussion

Hartford, Conn. — Meeting with the Society of Carbide Engineers, the Hartford ASTE chapter recently presented another of its popular panel discussions.

A. W. Meyers, director of research at Brown & Sharpe Mfg. Co., opened the forum with a lecture on "Carbide Milling," augmented with excellent slides. Speaking on "Single Point Carbide Machining," Robert A. Warfel, general foreman of tool grinding and application at Pratt & Whitney Aircraft, stressed problems of on-the-job performance in practical terms.

A. E. Glenn, manager of die sales for Carboloy Co., then finished the evening's individual speeches with an illustrated discussion on Carbide Dies.

After the formal talks the meeting was opened for discussion. The panel members were kept busy answering questions even after the technical program ended.

James F. Clancy, director of public relations at the Hartford County Rehabilitation Work Shop, was coffee speaker. His enlightening talk prior to the technical program resulted in voluntary financial contributions from members of both societies, to aid in the rehabilitation program that Mr. Clancy outlined.

Earlier in the evening the newly elected Hartford ASTE officers were inducted by Ray H. Morris, a former society president. The ceremony was further distinguished by the presence of two other past presidents, A. H. d'Arcambal and Irwin F. Holland. All three are members of Hartford chapter.

Officers for 1950-51 were Donald B. Huntting, chairman; Robert M. Toppin, first vice-chairman; Henry E. Kuryla, second vice-chairman; William T. Allison, secretary, and Robert F. Edmunds, treasurer. Mr. Edmunds was re-elected for the third time.

Thomas Hollis, Jr., president of the Carbide Engineers, conducted the technical discussions.

Arrangements were made by Harold Feingold of Underwood Corp. and Bernard Blacker of New Britain Gridley Co. Both are officers in the Carbide Society and ASTE members.

Past Presidents Participate in Installation Program

Poughkeepsie, N. Y.—Two former ASTE presidents figured prominently at Mid-Hudson chapter's installation night, March 14.

I. F. Holland of Hartford, Conn., who chartered the group in 1946, installed the following officers: Ellis W. Thorp, chairman; Ornendo Freer, first vice-chairman; William Schug, second vice-chairman; Floyd Tilton, Sr., secretary; Harry Carlson, treasurer; and Joseph Petz, delegate.

Mr. Holland, who is general superintendent of the Small Tool and Gage Div. of Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn., spoke briefly on "Tool Engineers Across the Nation," commenting on the Society's background and outlook.

Technical speaker was another former Society head, A. H. d'Arcambal, vice-president and sales manager, Niles-Bement-Pond Co. Discussing "Materials for Precision Cutting Tools and Gages," Mr. d'Arcambal named qualities and characteristics of various steels, and described current practices and applications.

During the meeting Mr. Holland presented certificates to those completing courses in engineering subjects, sponsored by the chapter in conjunction with the Poughkeepsie Board of Education.

The awards were: For Production Welding, Soldering, Brazing, Donald J. Walsh, Lester F. Tubby, Russell Seaman, Samuel Harris and Nicholas Just; Methods Engineering, James F. Drew, Daniel F. Hayes, Glenford Snyder and E. H. Caffrey; Precision Measurement, Ralph Bauer, Arthur G. Smith, James W. Dufficy, John C. Luhman, John Young, Eugene Edwards, Maxwell Paley, Raymond Dumville, Ford L. Protoss and Bruce Williams.

William J. Rich was instructor for the Production Welding course; Charles Brownell taught Methods Engineering, and William Shopmeyer gave the Precision Measurement lectures.

Guests from Greater New York chapter were: Julius Schoen, a past chairman; Joseph P. Schneider, first vice-chairman; Miss Virginia Martino, secretary; Jay Wohlfeld, education chairman; Harry Fink, former treasurer; Miss Idalyn R. Cohen, publicity chairman; Herman S. Freiman, editorial chairman; William Closter, Edward Eckler, employment chairman, and Joseph Brady, industrial relations chairman. Hartford chapter visitors included: William Allison, secretary; Donald Heaton, and Richard Holt.

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Top: Elected to guide the affairs of Mid-Hudson chapter are, from left: Ellis Thorp, chairman; Ornendo Freer, first vice-chairman; William Schug, second vice-chairman; Harry Carlson, treasurer; and Floyd Tilton, Sr., secretary. Center: Joseph Crane, International Business Machines engineer, shows operation of electronic tabulating and sorter to fellow ASTE'ers during tour of Poughkeepsie plant. From left: Joseph Petz, retiring chairman; Ellis W. Thorp, H. J. DePew, G. E. Wuest, Gordon Brownell and K. L. Snover. Bottom: I. F. Holland, a former ASTE president, awarded certificates to those completing Mid-Hudson's engineering courses. From left, seated: Ralph Bauer, Eugene Caffrey, Mr. Holland, Donald Walsh, Daniel Hayes, Nicholas Just; standing: Raymond Dumville, James Dufficy, Ford Protoss, John Luhman, William Shopmeyer, an instructor; Robert Estes, education chairman; Maxwell Paley and John Young.

Poughkeepsie Tennis Club was the setting for the chapter's annual ladies night, February 18. Dancing to the music of Russ Gilmore and his orchestra was enjoyed by the 160 members, wives and guests present. Each lady received a gift. Door prizes also were awarded. Late in the evening a buffet supper was served.

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Ralph N. Tozer, chief engineer of Michigan Broach Co., Detroit, addressed the 50 members and guests attending the February 14 meeting. His subject, "Broaches and Broaching," concerned general requirements for surface broaching. Mr. Tozer selected surface broaching because of its high production potentials, accuracy, and good finish.

Chairman Petz presided and introduced George Kenney, John F. Millett and Gordon Anderson, all new members, and J. P. Crosby, Boston chapter chairman.

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International Business Machines Night was the theme for the previous meeting. It was the second in a series of annual meetings sponsored in conjunction with local industries.

The 130 men attending were guests of the IBM Plant 2. Following dinner in the company cafeteria, the tool engineers were conducted through the entire plant to view manufacturing processes, assembly and testing of finished products.

After the tour the ASTE party assembled in the conference room where they were welcomed by I. Smith Homans, Jr., executive assistant.

Joseph McManus, plant superintendent, briefly reviewed the firm's history and described several new and improved machines now being tooled for production.

Technical feature was a talk by Max E. Femmer, technical engineer of the engineering laboratory. Mr. Femmer's lecture, "Electrons Roll Up Their Sleeves," included applications of electronic tubes in automatic steering of ships, duplication of colors in printing, automatic gaging, automatic door openers, production counting, weighing, sorting, and remote control of objects. In a brief business session John L. Petz, Llewellyn H. Tenney and Kenneth Snover were elected a committee to nominate chapter officers.

Richard Snow and Gustave Sundstrand were introduced as new members.

Committee in charge of arrangements for the event consisted of members from IBM as follows: Kenneth L. Snover, chairman; C. Henry Beiderbecke, Joseph Crane, Robert Estes, Joseph L. Petz, C. Peter Barone, S. E. Enright, Bruno Forscher, Arnold W. Kopser, J. Morris O'Hehir, Ludwig Schilling, Thomas R. Skoftland, Walter A. Stadtler, Gerald Stickle, John H. Tesmer, Floyd Tilton, Sr., George S. Vermiylea, W. Robert Wykstra and Nicholas Kadick.

Waindle Inducts Officers At Ladies Night Dinner

Chicago, Ill—Some 250 Chicago members and their women guests attended the chapter's annual ladies night, March 14, at the Furniture Club.

After a reception and dinner, Chairman Anton Schwister spoke briefly on the chapter's activities, then introduced Roger F. Waindle, national director and a member of the Fox River Valley chapter.

Mr. Waindle administered the oath of office to: Thomas C. Barber, chairman; Dale Long, first vice-chairman; Verne Loeppert, second vice-chairman; William R. Shroder, secretary; and John Beck, treasurer.

Following the installation Mr. Waindle addressed the group concerning benefits derived from the tool engineer's work, through modern conveniences and improved living standards.

Mr. Waindle also commented on his experiences as an official observer during the recent military maneuvers in the Caribbean.

Dancing, and selections by the orchestra's vocalists concluded the evening.

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Speaking February 1 before approximately 100 tool engineers, H. L. Stewart of Logansport Machine Co. compared fluid power to an electrical circuit.

Electrons flowing through wire are similar to fluid power coursing through pipes. The fluid operating valves are comparable to relays, switches and rheostats, while the pumps and motors perform the same functions as electric generators and motors.

He described pumps, vanes, pistons and diaphragms, operation and servicing of a hydraulic system.

With slides Mr. Stewart showed applications of hydraulic power to a bacon press, grain bin doors, a machine for pressing the splined shaft on airplane impellers, a post hole digger, a machine for laying coaxial cable, and other equipment.

Sorry

if we had to condense your story. Omission of ASTE News in the April Exposition number doubled the material for this issue. Other photographs and April meeting reports received for the May issue will be published in June.

Human Voice, Music Transmitted at 11 Million MPM

Rockford, Ill.—Voice communication now rushes through space at the rate of 11 million miles per minute, according to the Illinois Bell Telephone Co.

Using what might have been Buck Rogers apparatus, W. F. Wiedeman and M. G. Garneau, telephone company representatives, gave 100 Rockford ASTE'-ers and Jaycee's demonstrations of microwaves and other members of the "electrical family," which also provide pathways for television, radio and teletypewriter. The program was presented February 1 at a joint dinner meeting of the two organizations in the Lafayette Hotel.

With an oscillograph, the demonstrators showed the audience what ordinary vocal sounds look like as electrical impulses translated into vibrations (cycles) per second. Starting at 60 cps, they made the instrument pick up tones of 8000 cps and above, imperceptible to the human ear.

Sound Waves Light Bulbs

Among other demonstrations they made high frequency waves of ten billion cps light gas-filled bulbs, by guiding the waves through a hollow metal tube, then reflecting them off water.

To climax the program the audience took an imaginary telephone journey from a ship off South America to New York, Chicago, and finally to an automobile in Los Angeles, equipped with mobile telephone. This demonstration incorporated all the developments explained earlier.

* * *

On February 27 the tool engineers met with the Rockford Engineering Society, The Rock River Valley Electric Association and the Society of Production Engineers to see another spectacular stage demonstration. The Westinghouse "March of Research" was presented by Dr. Richard C. Hitchcock, research engineer, inventor and lecturer, in the Woodward Governor auditorium.

Watching a car rolling across a model bridge made of plastic, under polarized light, the audience saw by the changing color in the bridge members when, where, and how much strain was imposed. Such information aids the design engineer in planning the actual structure.

K42B, an expensive alloy used in jet engines and gas turbines, was next demonstrated. Heated to redness in an electric furnace, a bell made of this material resounded with a clear tone at a temperature where steel would give forth only a dull thud.

The listening technical men didn't know that a ¼ hp pulse jet engine could make a deafening noise. As the engine performed Dr. Hitchcock warned them to keep their mouths open to relieve pressure on their ears. They did.

Says H-Bomb Is Overrated

With an atom model he proved that many elements can be made by varying the primary "building blocks" of the atom—and the terrific energy released when the nucleus of the atom is smashed. He added that 20 million deg would be required to change heavy hydrogen to helium for a hydrogen bomb, that its destructiveness is only seven times that of the A-bomb—not nearly as great as publicized.

Dr. Hitchcock's hair stood up as he took an electrostatic "wallop" of 250,000 volts at low amperage. This illustrated how the high voltage of the atom might be used to run a motor.

* * *

The chapter installed its officers March 1 at a buffet supper at the University Club.

George Johnson, a former national officer, administered the oath of office to: George Rigeman, chairman; George Torrence, first vice-chairman; Bruce Lundgren, second vice-chairman; William Moreland, third vice-chairman; John Rice, treasurer; and Ernst Norrman, secretary.

Prior to the ceremony Karl Kaiser, retiring chairman, reported on the chapter's progress during the past season.

John Rice, membership chairman, presented ASTE car emblems to several men as awards for bringing in some of the 25 new members reported.

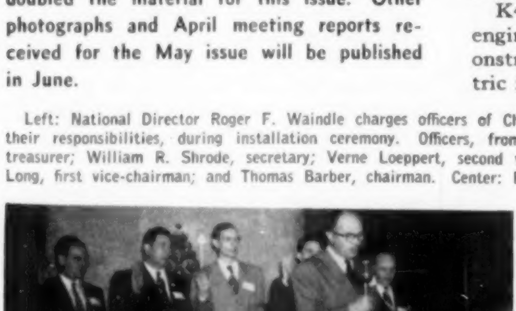
Two Air Force films concluded the program.

Doerner Elected V.P.

Chicago, Ill.—The election of Otto Doerner as vice-president in charge of manufacturing and engineering has been announced by Cummins Business Machines Corp.

Prior to joining Cummins more than two years ago as plant manager, the Chicago ASTE member was associated with National Cash Register, Zenith Radio and International Register.

Left: National Director Roger F. Waindle charges officers of Chicago chapter with their responsibilities, during installation ceremony. Officers, from left: John Beck, treasurer; William R. Shrode, secretary; Verne Loeppert, second vice-chairman; Dale Long, first vice-chairman; and Thomas Barber, chairman. Center: Past chairmen present at the ladies night installation dinner were, from left: Sven G. Goransson, Roy R. Hoefer, Frank Martindell, Clare Bryan, Fred J. Schmitt, Harold M. Taylor and Anton J. Schwister. Right: H. L. Stewart of Logansport Machine Co. explains to B. C. Brosheer a display piece illustrating his lecture on hydraulics.



...omising to uphold the Constitution of the Society are, from left: G. M. Waller, chairman; George Bodi, first ...-chairman; George Parsons, second vice-chairman; Philip Shaner, treasurer; and C. H. Olson, secretary. E. W. ...ett (right) a former national officer, reads the oath.

Material Handling Requires Competent Direction

Philadelphia, Pa.—To be successful the application of modern industrial equipment capable of tremendous economies in handling material in process requires supervision. Russell Manning, chief engineer, Material Handling Div., Yale & Towne Mfg. Co., emphasized this important consideration in a talk before Philadelphia chapter, March 16.

Mr. Manning supplemented his paper on material handling with lantern slides illustrating features and economies of various systems. In the initial planning, he cautioned, take time to study the available devices to be certain of having the most up-to-date and efficient design.

J. S. McCullough, general manager of sales promotion and advertising for Yale & Towne, traced the company's growth since 1840 when Landis Yale, the founder, made locks and hardware.

Dean Howard Gross of Spring Garden Institute introduced a group of 15 high school seniors, sponsored by individual chapter members.

In a brief farewell address, Retiring Chairman Emil Kitzman reported on the past year's activity.

Weaver Swears in Officers

James R. Weaver, a past president of ASTE, presented a past chairman pin and a brief case to Mr. Kitzman. Mr. Weaver then inducted as officers for the coming year: L. S. Paulsen, chairman; K. W. Riddle, first vice-chairman; W. J. Griffith, second vice-chairman; A. B. Luecke, secretary; F. J. De Frates, treasurer; A. R. Diamond, delegate; and H. W. Gross, alternate.

Chairman Paulsen accepted the gavel and introduced his fellow officers and the following committee chairmen: W. V. Czarnecki, Jr., public relations; J. F. Barnes, editorial; William Stevens, education; K. W. Riddle, program; Emil Kitzman, constitution and by-laws; P. A. Patterson, scholarship; Harry Smithgall, standards; Robert Lowry, membership; Clarence Duffany, good and welfare; C. K. Lennig, register and reception; Andrew McMillan, finance; Walter Phifer, entertainment; William Chalfont, industrial relations; and Foster M. Crayton, chaplain.

The chapter observed its 12th anniversary, February 16, with a dinner meeting at the Engineers Club, attended by 207 members and guests.

A birthday cake was presented to a group of past chairmen, seated at a special table. The former chief executives present were: C. O. Hersam, P. W. Frankfurter, J. A. McMonagle, Howard A. Gross, A. R. Diamond, S. R. Boyer, F. R. Crayton and Charles Crook.

Has Advantages Over Gaging

Salient features of optical inspection machines built by various manufacturers were described by Willis De Boer, vice-president and general manager of Engineers Specialties Div., Buffalo, N. Y.

By placing a part in the path of an optical projection and magnifying it on a screen, gaging costs can be eliminated, he explained. Parts such as jet blades, he stated, can be checked faster, more accurately and satisfactorily than with orthodox methods.

Since an inexpensive layout to the required magnification can be used as a gage, low production parts can be checked economically through optical comparators. Large parts can be checked a section at a time.

Charles Crook, nominating committee chairman, submitted his committee's slate of officer candidates and the members voted on these nominees.

How a journeyman jeweler's resourcefulness in making textile manufacturing and publishing equipment developed the present Baldwin Locomotive Works was related at the previous meeting, by J. R. Weaver, vice-president of the company. Mr. Weaver also referred to such company products as hydraulic presses, ship propellers, testing equipment, and turbines.

F. G. Tatnall, manager of testing research at Baldwin, discussed strain gages and the evaluation of test results.

Charles Crook, Jr., W. V. Czarnecki, Jr., and David J. Heckinger were elected a Nominating Committee.

H. E. Conrad, national executive secretary, was a guest and spoke briefly concerning the ASTE exposition and convention at Philadelphia, and other Society projects.

Waller Takes Office As Fox River Chairman

St. Charles, Ill.—March meeting of Fox River Valley chapter was a stag affair at the Baker Hotel.

Edward Dickett of Rockford, a former national officer installed the following officers: Chairman, G. M. Waller, Geneva; first vice-chairman, George Bodi, Aurora; second vice-chairman, George Parsons, Geneva; treasurer, Philip Shaner, Aurora; and secretary, C. A. Olson, Geneva.

Chairman Waller appointed as committees for the coming year: Program, George Bodi, chairman, C. T. Everett, William Kruck, Colin Kyle, Everett Kaser, C. E. Hunt and W. S. Bach; standards, R. F. Waindle, chairman, R. J. Evans and C. F. King, Jr.; nominating, B. J. Phillips, chairman; R. F. Waindle, H. J. Braun and T. L. Kings.

Public Relations and editorial, George R. Parsons, chairman, C. C. Moore and Colin Kyle; education, J. H. Babcock, chairman, and H. J. Braun; constitution and by-laws, B. J. Phillips, chairman, C. T. Everett and T. L. Kings; finance, P. C. Shaner, chairman, C. A. Olson, G. M. Waller; auditing, H. J. Braun and Colin Kyle.

Membership, P. C. Shaner, chairman, E. H. Wood, C. L. Bennett, W. B. Hamlin, M. A. Johnson, Jr., T. L. Kings, R. H. Kirwin, Emery Chesmadia, E. W. Kalb, W. D. Phillips, A. J. Walt, R. T. Berg, and D. J. Heidinger; problem, C. R. Moody, T. L. Kings, J. H. Babcock, R. J. Hanson, G. I. Marsh, Colin Kyle, George Bodi and A. M. Sundquist.

More than 60 members and guests attended the annual meeting, enjoying fishing pictures, door prizes and a social hour.

Krause Wins Chairmanship At Indianapolis Election

Indianapolis, Ind.—R. F. Krause was elected chairman of Indianapolis chapter at a meeting held February 2 at the Athenaeum. Other Nominating Committee candidates approved by the membership are: Ernest Hilkenbach, first vice-chairman; Dennis White, second vice-chairman; Joseph Penn, secretary; George Duncan, treasurer; H. W. Curfman, delegate; and Harry Boese, alternate.

After the election the 96 members and guests present heard a discussion of hydraulics by R. P. Esser, chief engineer of TEC Engineering Corp., Logansport, and a chapter member. Those not close to this field were surprised at the expanding use of hydraulics as described by Mr. Esser.

* * *

Another large group turned out for the installation of officers, March 2.

Technical feature was a talk on "Tool Steels, Their Heat Treatment and Application" by Howard J. Stagg of the Crucible Steel Co.

Eldon E. Healy drew an ASTE Handbook as door prize and R. F. Krause won another special award among the 18 prizes distributed.

Tool engineers in the Kansas City chapter and entertain their wives with installation dinner dance.

Installation Audience Sees Minetti, Staff Take Oath

San Francisco, Calif.—Golden Gate chapter installed its 1950 officers during a meeting at Curtola Cafe, Oakland, March 21. Floyd Snodgrass, a former chairman, conducted the ceremony.

The new officers are: I. S. Minetti, chairman; B. G. Berlien, first vice-chairman; T. J. Rohrer, second vice-chairman; David Gustafson, secretary; and Paul Pick, treasurer.

Films Show Broaching Precision

Guest speaker was J. P. Crosby, vice-president and sales manager, The Lapointe Machine Tool Co., Hudson, Mass., and chairman of Boston chapter, ASTE. Mr. Crosby related the history of "Surface Broaching" and its advantages in manufacturing large quantities of high precision parts. Two color films, showing the application of broaching machines to automotive, hardware and aircraft parts, stressed high economy of operation during broaching of intricate shapes, with tolerances of less than 0.0005 in.

During a question and answer session following the motion pictures, the speaker capably answered questions from the audience.

Approximately 110 members and guests attended the dinner and technical session.

* * *

"Trade Secrets" was the program feature of the February 21 meeting, held at the Union League Club in San Francisco.

Three chapter members presented special tooling equipment developed in their respective plants. George Metke of The Enterprise Engine & Foundry Co. was the first speaker. He detailed the operation of a special boring bar that bores and grooves diesel engine block cylinders in one operation. A drawing and a stereoptican slide were shown to clarify the unique device.

Louis Talamini of the Schlage Lock Co. described an eight-station progressive die for producing an intricate lock part in a continuous process. Slides and drawings showed in detail the setup and working of this intricate die. Sample strips of metal, demonstrating progressive operations, were displayed along with the finished parts.

The third item, presented by Anton Severdia of the Severdia Mfg. Co., was a complicated progressive die for the manufacture of louvers. The feature of this die is the simple method of adjusting it for different sizes of louvers. A drawing, slides, and samples of the finished product augmented Mr. Severdia's talk. Mr. Talamini prepared all the drawings and slides used by the speakers.

A business session and election of officers preceded the technical program. Julian LeSire of the O. L. King Oil Co. entertained with accordion selections during the election. John J. McGrann and Marion H. Hykes of the Timken Roller Bearing Co. presented an animated cartoon film, "Big Tim," featuring the use of roller bearings in railroad equipment, particularly freight cars.

Seventy-two members and guests attended the dinner meeting.

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O. J. Seeds, manager of sales engineering, Cerro de Pasco Copper Corp., discussed "Industrial Cost-Cutting with Cerro Alloys" at an earlier meeting. Mr. Seeds reviewed the history and development of low-temperature-melting bismuth alloys. Bismuth, he explained is a heavy, brittle, coarse crystalline metal, tin-white in color. It expands 3.3 percent of volume in changing from liquid to solid. This expansion property influences the behavior of its alloys, making them non-shrinking in character.

Some Grow in Solid Form

These alloys, the speaker continued, are of high specific gravity, relatively soft, have low tensile strength, are brittle to shock, yet subject to plastic flow. They are relatively poor conductors of both heat and electricity. For the most part, alloys containing 45 percent bismuth exhibit expansion during solidification. Some, particularly those containing lead, grow further in the solid state.

A number of eutectic and non-eutectic alloys have been standardized, according to Mr. Seeds. Some of the most popular uses for the alloys are in anchoring, chucking, making cores for molding and forming plastics, dies and punches, models and patterns and tooling setups to facilitate production methods. Mr. Seed's talk was accompanied by 70 slides illustrating applications. An assortment of items fabricated with the aid of Cerro alloys was on display.

Chairman James Coulter introduced the speaker to a large audience at the El Curtola Club.

K.C. Officers Inducted At Annual Dinner Dance

Kansas City, Mo.—Kansas City chapter ushered in its 1950-51 officers at the annual dinner dance, held March 1 at the Aladdin Hotel.

Two hundred and seventy tool engineers, their wives and guests looked on as Past Chairman Ward Osborn installed: W. H. Lebo, chairman; Ivan Nelson, first vice-chairman; John T. Needham, second vice-chairman; Warren Ricketson, secretary; and Earl K. Hudson, treasurer.

John Mirick presented a past chairman pin to Samuel Waas, outgoing chairman. Approximately 100 door prizes were distributed during the evening.

* * *

More than 50 members and guests attended the February 1 meeting at the Advertising and Sales Executives Club.

Col. Paul D. Berrigan, chief of the U.S. Engineers, 7th Corps Area, Kansas City, spoke briefly on the history of this branch of the service. He presented a sound film, "Taming a Wild River," showing flood control, and development of recreational facilities.

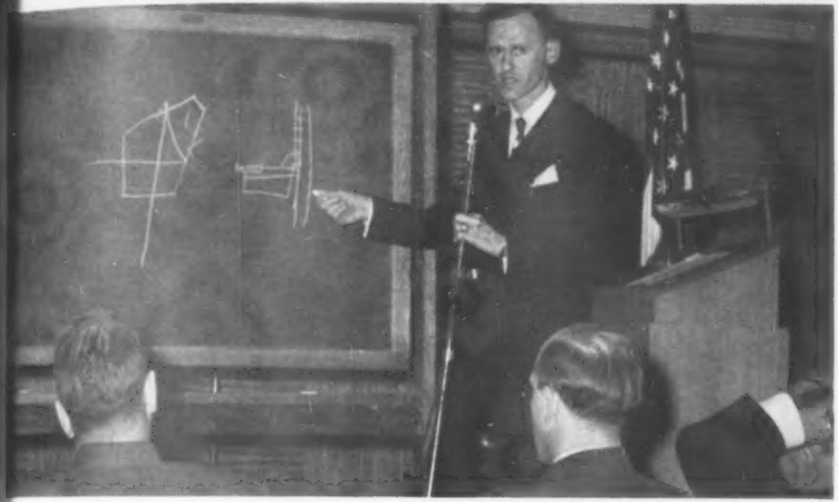
Colonel Berrigan explained a plan being developed to protect Kansas City from a repetition of the damage following the floods of 1844 and 1903. A system of levees and reservoirs along the Kansas and Missouri rivers is expected to control high water.

Following the program, officers were elected for the coming year.

Heimann Named Chairman

Milwaukee, Wis.—Officers elected by Milwaukee chapter at a recent dinner meeting are: Herbert Heimann, chairman; Walter Behrend, first vice-chairman; Waldemar Klein, second vice-chairman; Eugene Anspach, secretary; Frank Shimky, treasurer; Joseph Ebner, delegate; and Arthur Schaeffer, alternate.

Main speaker on the program was Stanley A. Brandenburg, vice-president in charge of sales of Monarch Machine Co., Sidney, Ohio. His discussion of "Latest Developments in the Turning Field" was followed by four films: "Air Gage Tracer," "Monarch Tool Room Lathe," and two Monomatic pictures.



Top, left: Robert W. Stokes, public relations methods supervisor, New England Telephone and Telegraph Co., and his assistant, Mr. Palmer, put on a demonstration of modern telephony at Boston chapter meeting. Right: Members inspect tool exhibits that preceded meeting. Below: Alexander Kastelowitz, chief of methods, Republic Aviation Corp., makes a drawing to put across a point during lecture on optical telescope-collimator.

Finer Finishes Claimed For Electronic Control

Galt, Ont.—Grand River Valley members acquired a wealth of information valuable to machine users and builders, when W. J. Franks of Canadian General Electric Co. addressed their March 3 meeting on the subject, "Modern Electric Control of Machines and Industries."

With slides he compared electric and electronic controls, calling attention to the finer finish produced through the electronic control method.

One highlight of the lecture was the speaker's description of the "play back" method of automatically controlling machine tools. He told how a machine can be set up by an experienced operator and the operations recorded on tape. Then the machine can be set up for automatic control, with an unskilled worker to load and unload it. Charles Spicer of Guelph thanked Mr. Franks for his lecture.

During a business session Harry H. Whitehall, chapter chairman, announced an educational program to be sponsored by the chapter. Alexander Welker, education chairman, outlined some of his committee's plans and introduced Fred Pugh, director of education for the Kitchener Waterloo Collegiate and Vocational School. Mr. Pugh complimented the group on their intentions and explained his institution's cooperation in their endeavor.

Approximately 90 members and guests were present for the meeting held at the United Farmers' Co-operative Hall at Guelph.

* * *

The membership endorsed the charter officers by returning the entire group for the 1950-51 term in an election, February 3, at the Grand River Golf and Country Club, Bridgeport. Executives of the young chapter are, in addition to Mr. Whitehall: Harry Sehl, first vice-chairman; William Copp, second vice-chairman; Joseph Strite, secretary; and Percy Barber, treasurer.

Clarence Beingesner, manager of B & W Heat Treating in Kitchener, introduced the guest speaker, C. E. Herington, Meehanite Corp., Cleveland, Ohio. Mr. Herington's subject was "Meehanite and Its Application to Machine Parts, Cams, Dies, Fixtures and Tooling."

After comparing the physical characteristics and grain structure of this metal with conventional cast iron, the speaker recommended more extensive use of this material in die work. Slides and motion pictures demonstrated uses in this field and in machine building. A lively question period followed. Frank Lewis expressed the chapter's appreciation of Mr. Herington's presentation.

A buffet lunch was served during a social hour.

New Transistor Tube Amplifies Current

Boston, Mass.—A demonstration of telephony by radio, presented by the New England Telephone and Telegraph Co., highlighted the February election meeting of Boston chapter.

Robert W. Stokes, public relations methods supervisor, assisted by a Mr. Palmer, showed the newest developments in radio relay in transmitting speech and music.

Characteristics of the radio beam and its similarity to light waves were demonstrated by Mr. Stokes. With metallic plates, he reflected a beam, over which music was being sent, through several angles before it was picked up by a receiver at the other end of the stage.

Germanium Magnifies Current

While describing the equipment, Mr. Stokes showed the operation of the transistor tube, ultimately expected to replace the familiar electronic tube. In the new tube current is magnified 40 times by passing through a block of germanium.

During a business meeting Chairman J. P. Crosby and Nominating Committee Chairman J. X. Ryneska conducted an election of officers. The new chapter executives are: A. J. Leone, chairman; Prof. P. A. Smith, first vice-chairman; Harold Seekins, second vice-chairman; Salvatore Gianino, secretary; Karl G. Nowak, treasurer; J. B. Savits, delegate; W. W. Young, alternate; and W. B. Wells, Engineering Society of New England councillor.

Prior to the meeting there was an afternoon industrial exhibit, sponsored by chapter bulletin advertisers and others. The display included cutting tools, gages and machinery.

* * *

How optical instruments have replaced plumb lines in sighting centerlines on aircraft assembly was explained to 175 men attending the previous chapter meeting.

Sights Long Centerline Accurately

Alexander Kastelowitz, chief of methods, Republic Aviation Corp., Farmingdale, L.I., cited an example of an 18 in. airelon hinge pin whose centerline must be within a tolerance of 0.001 in. with a fuselage wing connection bearing point possibly 30 feet away.

The optical telescope-collimator described by Mr. Kastelowitz, literally locates points in space by means of instruments set up at each end of the centerline to be established. By sighting an imaginary line through the cross-hairs of the two instruments, jigs, such as wing strut assembly fixtures, can be located.

Extremely accurate, the collimator can check a centerline 100 feet in length with an alignment of 0.0015 in. at six seconds of an angle. In machine tool building it may be used in checking the accuracy of planer beds.

Another instrument mentioned was the optical square, useful for checking milling machine tables within one to two seconds angle.

Douglas Installs Officers At Executives Night

St. Louis, Mo.—Four hundred and fifty-three St. Louis tool engineers and their guests crowded the DeSoto Hotel ballroom for the chapter's annual executives night dinner, March 2.

Honor guest was Retiring President Robert B. Douglas, who installed the following incoming officers: Emil Stempfle, chairman; L. W. Greenblatt, first vice-chairman; E. P. Huchzermeier, second vice-chairman; H. G. Oberle, secretary; William Bachman, treasurer; H. M. Creasey, delegate; and W. G. Callies, alternate.

Always a favorite with the St. Louis group, Dr. Hilton Ira Jones, director of research for Hizone Laboratories, Wilmette, Ill., made another return appearance as guest speaker.

Analyzes Laughs

Dr. Jones' subject, "What We Laugh At and Why," was amusing, with logical and scientific aspects. After dividing laughs into six categories, Dr. Jones explained each classification.

The St. Louis Metropolitan Police quartette entertained during coffee. Mr. Creasey handled arrangements for the function.

Earlier in the day the Executive Committee was host to President Douglas for luncheon at the Bevo Mill. The group exchanged views on national and local Society problems. Mr. Douglas received one of the handpainted ASTE neckties with which the chapter honors visiting national officers.

* * *

Herman Goldberg, president of Snow Mfg. Co., Bellwood, Ill., was the principal speaker at the February 2 meeting.

Demonstrating on a machine as he talked, Mr. Snow explained drilling, tapping and threading various metals. Only 10 percent of tool efficiency, Mr. Goldberg claimed, is obtained from taps and drills. The other 90 percent of the tool's value is thrown away.

Production Lost on Taps, Drills

By running them at low speeds, he charged, industry fails to take full advantage of the quality taps and drills available today. Mr. Goldberg cited cases where 6000 to 8000 tapped holes per hour were turned out on a single-spindle machine.

Taps aren't brittle or fragile, he added. Breakage comes from inefficient use of the tool—about 95 percent being due to chips jamming the tap.

In summary the speaker stressed the following points as essential for efficient tapping and drilling service: proper alignment, true running, rigidity, and chip disposal.

During the evening officers were elected for the coming year, and Retiring Chairman W. G. Callies thanked the officers and committees for their cooperation during his administration.

Second Vice-President J. J. Demuth, a national director and chapter member, urged members to attend the Philadelphia exposition and convention.

Beck Tells Students How Automatic Evolved

Chicago, Ill.—Using a model lathe, John Beck, head of the tool room, tool design, and manufacturing operations at Motorola, Inc., recently demonstrated to the ASTE student section at the Allied School of Mechanical Trades how this machine had developed into the automatic screw machine.

Mr. Beck showed methods of holding a workpiece in the lathe, how the lathe collet was developed for use in the automatic, and operation of the feed finger. Tooling, setups, feeds and speeds were explained, along with the history of this machine industry. H. H. Katz, director of the school and education chairman of Chicago chapter, introduced Mr. Beck, who is chapter treasurer.

Richard Lingen, chairman of the student group, presided and conducted an election for secretary. J. M. Duda was named to fill this vacancy.

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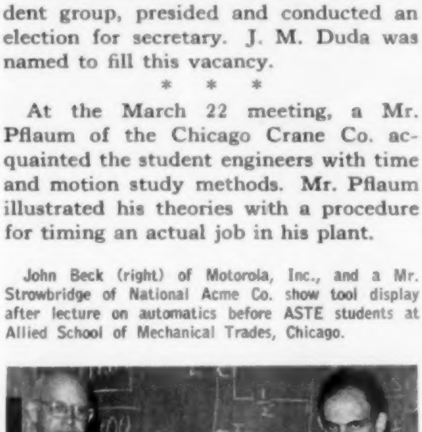
At the March 22 meeting, a Mr. Pflaum of the Chicago Crane Co. acquainted the student engineers with time and motion study methods. Mr. Pflaum illustrated his theories with a procedure for timing an actual job in his plant.

John Beck (right) of Motorola, Inc., and a Mr. Strowbridge of National Acme Co. show tool display after lecture on automatics before ASTE students at Allied School of Mechanical Trades, Chicago.



High School Students Learn About Tool Eng'g

Chicago, Ill.—The tool engineer's place in the American economy was impressed on the 400 students and faculty members of St. Mels High School who heard H. H. Katz, education chairman of Chicago chapter, speak on this subject, March 27.

Mr. Katz reviewed the background of the tool engineering profession, its importance to national defense, the Society's functions and contributions to the advancement of this branch of engineering.

His lecture was the first of a series of 25 to be given in the parochial high schools of the city. In addition 10 talks are scheduled for technical high schools. In August he will address the state high school teachers' summer conference at Urbana.

The May issue of *Illinois Vocational Progress* carries an article by Mr. Katz.

Executives Night Honors Area Aircraft Builder

Newark, N. J.—Northern New Jersey chapter honored the Curtiss-Wright Corp., March 14, when about 300 members and industrial executive guests gathered at the Robert Treat Hotel for the chapter's annual executives night.

Following dinner Chairman John E. Epprecht introduced the speakers table. Harry E. Conrad, ASTE executive secretary from the Detroit headquarters, urged attendance at the Society's Philadelphia exposition and convention. After presenting the recently elected chapter officers, Mr. Conrad installed: A. J. Schmidt, chairman; James Allan, first vice-chairman; George W. Sharp, second vice-chairman; H. Wilson Ryno, secretary, and Arthur J. Wotowicz, treasurer.

Speaker of the evening was Roy T. Hurley, president of Curtiss-Wright Corp., Wood-Ridge. In his address, "Lower Costs by Increased Knowledge of Machines," Mr. Hurley discussed his study of standards for machinability.

Chemical analysis of the material being machined is an important factor. By having all the material for a job of a standard high in machinability, his firm obtained a 200 to 300 percent increase in production, he stated. Tools and machines also were credited with the accelerated output. Machine tool builders, he added, must keep pace with advances in knowledge of machinability.

Lt. Col. Charles R. Douglass, Air Force officer in charge at the Curtiss-Wright plant, spoke prior to Mr. Hurley's address. Colonel Douglass considered our present world position and stressed preparedness for any emergency. If an aggressor strikes, he warned, there will be no time to organize and get into production.

Aircraft Cost Estimating Requires Special Methods

Wichita, Kans.—"Pre-Production Estimating of Airframe Tooling and Production Costs" was explained to Wichita chapter by one of its former chairmen, when Leigh Ickes of Beech Aircraft Corp. addressed 55 members and guests at a meeting held February 8.

When a new model aircraft is conceived, Mr. Ickes pointed out, its cost must be estimated by economical but effective methods. The standard procedure of estimating for each part is expensive for low production.

Statistics compiled from war production records have shown that each type of airframe requires approximately the same number of manhours to tool and build on a per-pound basis. By utilizing this experience, the anticipated cost of a new model can be reasonably determined. As production increases, Mr. Ickes added, the decrease in manhours per unit follows the log-log curves rather closely.

Officers elected during the meeting are: Emanuel Pitsch, chairman; Hazen Dool, first vice-chairman; Orville Strahm, second vice-chairman; James L. Hill, secretary; and R. O. White, treasurer.

ation's Economy Hinges On Machine Tool Makers

Springfield, Vt.—Practically every industry is dependent upon some 200 U.S. machine tool makers, Tell Berna, general manager of the National Machine Tool Builders' Association, told the 75 members and guests of Twin States chapter attending a meeting March 9 at Trade Winds Cafe.

Without this relatively small number of machine tool builders, thousands of other manufacturers would be unable to produce economically, Mr. Berna stated. A firm believer in free enterprise, he denounced government controls on industry. He compared government regulation of machine tool depreciation to having a federal agent decide when a motorist's automobile is sufficiently worn out to permit purchasing a replacement.

ricson Conducts Installation

Before Mr. Berna's address V. H. Ericson, national director from Worcester, Mass., installed the new slate of officers: H. H. Ranney, chairman; F. J. McArthur, first vice-chairman; Robert Laffin, second vice-chairman; George Julian, secretary; and Clifford Howe, treasurer.

Mr. Ericson also presented a past chairman pin to L. M. Davis, retiring chairman. Wilbur Handy, first chairman of the chapter, passed along to Chairman Ranney the chapter's long-lost charter. Mr. Ranney introduced the guest speaker.

Another special guest was Albert Gutterson, a local industrial supplier. He and Mr. Berna were former Olympic teammates, Mr. Gutterson winning renown as a broad jumper and Mr. Berna excelling in the two-mile run.

William Piper, a past chairman, led group singing, accompanied by Waldo Rostan at the piano.

* * *

The soundness of modern gear design and manufacture was impressed on the engineers when Darle W. Dudley, section engineer in the gear development department at the Lynn, Mass., General Electric plant, spoke on gearing at the February 8 dinner meeting. Mr. Dudley informed some 50 members and friends that inspection of the large marine gears on the S. S. *Brazil* had revealed that after 18 years' use at sea, the gear elements required no repairs. The periphery of one of these gears, Mr. Dudley estimated, had traveled around on its axis over 1,700,000 miles.

Mr. Dudley discussed ground versus shaved gears, testing machines for checking gears, and large machine tools used in the manufacture of marine, aircraft, railroad, control, and appliance gearing.

He added that gears are now made of such varied materials as steel, nylon, textolite, and cintered metals.

Guests included M. Blais of Springfield and G. F. Cushing of Windsor, Vt.; F. P. Gilligan, Hartford, Conn.; F. B. Engle, Claremont, N.H.; A. H. Bideford, Grafton, C. H. Stoverod, Springfield, J. G. Milner, Worcester, W. J. Sheehan, Walpole, and R. V. Schmalz, Norfolk, Mass.

Hamilton Members Night Features Home Talent

Hamilton, Ont. — Hamilton chapter held its annual Members Night recently at Fisher's Hotel. Some 75 members and visitors were present for the dinner and technical session.

Percy Barber, tool designer and plant superintendent, Hardware Div., Onward Mfg. Co., Ltd., Kitchener, lectured on "Die Design Relative to Hardware Production." Mr. Barber heads the chapter's Constitution and By-Laws Committee.

Percy Barber (left) of Onward Mfg. Co. tells Hamilton members how dies are designed in hardware manufacturing. William Peacock compares national and unified threads.

William Peacock, second vice-chairman of the chapter, followed with a slide-illustrated talk on "Comparison of National and Unified Threads." Mr. Peacock is tool designer and service representative of Champ Tools in Galt.

Gordon Hall, George Gilmour and John Snyder were elected a chapter Nominating Committee to prepare a slate of officer candidates.

For outstanding work in the ASTE evening classes at Westdale Secondary School, during the 1948-49 term, Gerald Williams received an ASTE Handbook. C. E. Bulmer, education chairman, made the presentation.

Chairman Gilmour announced that the following new members had been accepted during the past month: Frank E. Ansell and John Morice of Hamilton; William E. Durant, Dundas; Alfred McCann, Galt; and Thomas F. McMaster, Hespeler.

Entertainment Chairman Sidney Dunn presented a program of chapter talent including songs by Messrs. Churchill, Locke and Dunn, and a baritone horn solo by David Rolland.

John Ball won the door prize and John Rebell was awarded a complimentary dinner ticket.

Joins Illinois Tool

Detroit, Mich.—Hollis H. Mosher has been named sales engineer for Illinois Tool Works in the Detroit sales office, E. E. Valy, sales manager has announced.

Prior to joining this firm Mr. Mosher was associated with the Detroit office of Firth-Sterling Steel Co., directing carbide sales operations. Earlier, the Detroit chapter member was a master mechanic at the Jacobs Aircraft Engine Co., Pottstown, Pa.

Barker Succeeds Masucci As Chairman at Utica

Utica, N. Y.—Mohawk Valley chapter installed its new officers at a dinner meeting in the Moose Home, March 28.

Thomas J. Donovan, Jr., national director from Philadelphia, conducted the installation ceremony, swearing in: Fred Barker, chairman; Arnold K. Schroeder, first vice-chairman; Albert Delmont, second vice-chairman and delegate; Paul Lyman, secretary; Nicholas H. Kinney, treasurer; and Ernest J. Masucci, alternate.

Mr. Donovan talked about the development of tool engineering and mass production, and detailed benefits of membership in the Society.

Mr. Masucci, the retiring chairman, reported on chapter activities during his administration. Approximately 50 members were present.

* * *

The trend in modern manufacturing plants is toward more completely automatic production operations, Otto W. Winter, president of the Acme-Winter Co., Buffalo, N.Y., and a former ASTE president, emphasized to 42 members attending the chapter's February 28 meeting.

This trend, Mr. Winter added, greatly increases the importance of tool engineering and the need for teaching tool engineering subjects in vocational and high schools. The speaker, who served for a number of years as national education chairman of the Society, traced the progress of the organization since its founding in 1932.

Chairman Masucci presided, introduced Mr. Winter and conducted an election of officers.

Ingham Elected Chairman By Springfield Group

Springfield, Mass.—Wendell Ingham, tool design engineer for National Blank Book Co., Holyoke, has been elected chairman of Springfield chapter. The election was held February 15 during a dinner meeting at Rovelli's Restaurant.

Chosen to aid Mr. Ingham with the ASTE work are: Jason Doubleday of A. G. Spalding & Bros. Co., first vice-chairman; Kenneth Stroble of Braeburn Alloy Steel Co., second vice-chairman; Peter Scott of Springfield Armory, treasurer; and Walter Kusek of Smith & Wesson, Inc., secretary.

Mr. Ingham and Mr. Doubleday were elected convention delegates.

During the meeting the chapter heard a progress report on attempts to standardize screw threads on an international basis. This report was presented jointly by William Gourlie of the W. H. Gourlie Co., West Hartford, Conn., an agent and thread design consultant of the Sheffield Corp., Dayton, Ohio, and Paul DesJardins, chief designer of the Small Tool Div., Pratt & Whitney, West Hartford.

Both men have participated in international discussions, at Ottawa, Ont., and in European cities. Mr. Gourlie showed travel slides in color after the technical discussion.

Stark Inducts Successor At Iowa Inauguration

Cedar Rapids, Iowa—John Stark, retiring chairman of Cedar Rapids chapter, installed the incoming administration at a meeting held March 15 at the Montrose Hotel. The new officers are: Chairman, Elliott Wheeler; first vice-chairman, W. D. Popek; second vice-chairman, Edward Klouda; secretary, Richard Coyner; and treasurer, Carroll Bryant. After the ceremony Ray Bextine presented a past chairman pin to Mr. Stark.

Technical speaker was J. W. Shugars, district manager and field engineer for Lincoln Electric Co. His subject was "Welding Design For Economy." With films and slides Mr. Shugars showed a cost comparison between castings and fabricated weldments. Properly designed, the fabricated weldments are cheaper, lighter, and less brittle than castings in the same applications.

Attendance included 31 members and eight guests. Among out-of-town visitors were Edward M. Mielnik, assistant professor of the School of Mechanical Engineering at Iowa University, and Earl Compton, a university student.

Memorial Meeting Honors Dean

On February 14 the chapter met with the local ASM group and the student branch of ASME at the Memorial Union on the University of Iowa campus, Iowa City. Given in memory of John Fielding, dean and professor of the university School of Mechanical Engineering, the dinner was attended by 250 members and guests of the three societies.

Luther B. Smith, chairman of the ASME students, welcomed the visitors. M. C. Kendall, ASM chairman, Professor Mielnik, and John L. Stark, ASTE chairman, paid tribute to Dean Fielding and concurred in the hope that similar meetings might be held annually.

Mr. Stark introduced the technical speaker, H. B. Osborn, Jr., technical director, Tocco Div. of Ohio Crankshaft Co. Mr. Osborn's topic, "Induction Heating as Applied to Industry," concerned the mechanics and the electronics phases of this method of surface heating and surface hardening.

After Mr. Osborn's address, the three societies made a conducted tour of the university's engineering laboratory. One feature of the tour was a demonstration of induction heating by A. H. Pittaway, application engineer of Ohio Crankshaft Co., assisted by T. C. Wheeber, laboratory mechanician.

Election of officers followed, under the direction of Chairman Stark.

* * *

The previous meeting featured a public presentation of the General Motors production, "Previews of Progress."

An audience of nearly 500 men, women and children enjoyed a two and one-half hour program, woven around scientific achievements of the past 50 to 75 years and presented in a nontechnical manner.

Demonstrations included lighting, sound recording, cooking without heat, and broadcasting on a beam of light.

Binghamton Starts Year With Conine in Chair

Binghamton, N. Y.—During a dinner meeting March 8 at Vestal American Legion, Binghamton chapter installed the following new officers: George Conine, chairman; Ronald K. Brewer, first vice-chairman; Donald Ellis, second vice-chairman; W. A. L. Leindecker, secretary, and Howard D. Bertholf, treasurer. Dean H. Erlenmeyer, retiring chairman, was sworn in as chapter delegate. He also received a diamond past chairman pin.

After the installation Olin Cochrane, superintendent, Fine Welt Factory, Endicott Johnson Corp., Endicott, N. Y., discussed the manufacture of shoes, sales competition, and the need for more automatic machines in this industry.

Sixty-six members and guests attended this meeting.

Judkins Explains Tapping Of Carbide Die Inserts

Louisville, Ky.—March meeting of Louisville chapter featured a discussion on the design and application of carbide tools, presented by Malcom F. Judkins, chief engineer, Carbide Div., Firth Sterling Steel & Carbide Co. Sponsored by The Industrial Equipment Co. of Louisville, the session was supplemented with a half-hour film.

Mr. Judkins was thorough and precise in his lecture, describing carbide tools from inception to present methods. Interesting applications were explained, such as tapping carbide ring inserts used in blanking dies.

Prior to the technical discussion chapter officers were installed and committee chairmen named for the ensuing year.

Past Chairman N. H. Booker reported on activities of the yast year.

Incoming officers at Madison are introduced to their fellow ASTE'ers. From left: Charles Neff, treasurer; Edward Helmke, secretary; John Holley, third vice-chairman; Hans Heydn, second vice-chairman; Alfred Hoffer, first vice-chairman; and W. R. Carnes, chairman.

Madison Ladies, Guests At Annual Installation

Madison, Wis. — Approximately 40 couples attended Madison chapter's fourth annual installation of officers and ladies night at Heidelberg Hofbrau, March 14.

Prof. H. F. Owen of Purdue University, third vice-president of the Society, installed the newly-elected officers: W. R. Carnes, chairman; Alfred Hoffer, first vice-chairman; Hans Heyden, second vice-chairman; John Holley, third vice-chairman; Edward Helmke, secretary; and Charles Neff, treasurer.

Professor Owen spoke inspirationally concerning the broader aspects of the Society.

Shows Wacky Inventions

Another "Professor," Russell E. Oakes, the "Wacky Wizard of Waukesha," entertained the audience with his collection of "goofy gadgets."

* * *

On February 7 J. I. Karash of Reliance Electric and Engineering Co., Cleveland, analyzed the reasoning required to determine the type of jig for a given job. Only after it has been properly visualized, he said, can a jig be drawn up. Mr. Karash addressed a dinner meeting of 65 members and guests at Lippner's Restaurant.

Cary Heads Little Rhody For 1950-51 Term

Providence, R. I.—Little Rhody chapter installed its 1950-51 officers at a meeting held March 2 at Oates' Tavern, North Providence. Past Chairman Wilfred Pender administered the oath to: Francis H. Cary, chairman; Carlo B. George, first vice-chairman; Matthew Grochmal, second vice-chairman; Fred W. Kunath, secretary; and Philip J. Peckham, treasurer.

Retiring Chairman Delbert Krahnke reported comprehensively on chapter activities and accomplishments for the past year and expressed appreciation for support and enthusiasm shown.

Ralph E. Rawling, president and treasurer of Rawling Gear Works, Inc., Worcester, Mass., was technical speaker. His lecture, "Gear Cutting," was accompanied by color slides. Mr. Rawling covered the "do's" and "don'ts" of design, common errors and causes, gear cutting machinery and unusual set-ups, testing and measuring. His talk included discussions and standards from the American Gear Manufacturers Association.

Included among the approximately 50 members and guests present was a delegation from Worcester Chapter, headed by Carl Schofield, retiring chairman.

* * *

Clifford W. Kennedy, quality control engineer for Federal Products Corp., addressed the February 2 meeting.

With the aid of illustrations and charts, Mr. Kennedy showed how both large and small shops may benefit economically and through better work by applying controlled inspection and investigation.

HE TOOL ENGINEER'S *Service Bureau*

EE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

mination
ecently published study of the Illuming Engineering Society, "Lighting for chining of Small Metal Parts" presents mination recommendations for indus illustrated by photos and application wings; 50c. Publications Office, **Illumting Engineering Society, 51 Madison** ., New York 10. **L-1**

l Bearing Gaging
Brochure B3.4-1950, on gaging practices ball and roller bearings, specifies most eptable methods of determining whether rings conform to specification dimenns; defines inspection methods giving ing loads and methods of measuring; ndards on bearing tolerances. **American Standards Association, Inc., 70 E.** h St., New York 17. **L-2**

ay Iron
Recently revised summary of gray iron ecifications including changes and addins; covers general, automotive, pressure d non-pressure castings. **Gray Iron** **ounders' Society, 210 National City—E.** h Bldg., Cleveland 14. **L-3**

rrous Castings
Ninth in series of folders shows variety f ferrous castings for mobile equipment; resses part played by care and human dgment in production of castings. **Belle ity Malleable Iron Co. and Racine teel Castings Co.,** Racine, Wis. **L-4**

ronze Bearing Bars
Handy pocket size reference guide, No. 0, listing machined and solid maintence bars and standard sleeve type bearngs contains easy-to-use cut-out index plus ctions on bronze alloy analysis and tolernces for bearings and bars. **The Buckeye Brass and Mfg. Co.,** 6410 Hawthorne, leveland 3. **L-5**

Nickel
"Nickel-Containing Materials in Tractors and Farm Implements" presents interesting analysis of industry's activity in this field; accompanied by graphs and technical data. **The International Nickel Co., Inc.,** 67 Wall St., New York 5. **L-6**

Low-Temperature Welding
Pocket-sized 32-page catalog and handbook contains tables of characteristics of both gas and arc welding accessories, full application information, general information for workers in metal-joining industries; also lists company's line of rods and fluxes, and alloys. **All-State Welding Alloys Co., Inc.,** 273 Ferris Ave., White Plains, N. Y. **L-7**

Boiler Tubing
The Babcock & Wilcox Tube Co., Beaver Falls, Pa., has issued price sheets, showing in tabular form prices per hundred feet for all quality brackets of its seamless carbon steel merchant boiler tubes. **L-8**

Aluminum Paint
Folder on specialty aluminum paints gives details, including price, on types for applying directly over rusted surfaces, for heatresisting interior and exterior work, acid and alkali resisting, for rusted chain link fences, and utility painting. **The Skybryte Co.,** 3125 Perkins Ave., Cleveland 14. **L-9**

Dust Collectors
Bulletin 610, picturing various models dust collectors for large and small problems, tabulates comparison of all units in the line, gives general recommendations; includes specification drawing and tables for accessories. **Aget-Detroit Co.,** Ann Arbor, Mich. **L-10**

Punch Presses
Four-page color folder pictures and describes Emco power punch press showing common uses, specifications and special features, and lists typical users. **E. O. Klaas, The Klaas Machine & Mfg. Co.,** 4314 E. 49th St., Cleveland 9, Ohio. **L-11**

Gear Hobbing
Highly illustrated catalog 233 presents complete specifications and descriptions of company's most recent line of gear hobbing machines; supplemented by production examples. **Gould & Eberhardt, Inc.,** Irvington 11, N. J. **L-12**

Reels
Four-page circular illustrates and describes plain and motor driven standard automatic centering reels for holding coils from 300 to 6,000 lb; specifications tables included. **F. J. Littell Machine Co.,** 4201 N. Ravenswood, Chicago 13, Ill. **L-13**

Heaters
Catalog sheet lists induction heaters and control instruments manufactured for preheating before welding and stress relieving after welding, with illustrations and description for quick information. **Electric Arc, Inc.,** Newark, N. J. **L-14**

Impregnation Unit
Brochure on company's mechanical impregnation and bonding process describes its use for prevention and correction of porosity in metal castings, or for simultaneously bonding similar and dissimilar materials to each other in parts requiring high shear and internal pressures; also illustrated technical data. **Western Sealant, Inc.,** 9042-48 Culver Blvd., Culver City, Calif. **L-15**

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Metal Working

Reference file folder on company's stamping and metal working facilities contains analysis of production facilities, including detailed list of plant equipment. **Charles T. Brandt, Inc.**, 1700 Ridgely St., Baltimore 30, Md. **L-16**

Casting Charts

Two recently revised steel casting reference charts for carbon and low alloy, stainless, corrosion and heat-resistant alloys give specification designations, analyses, physical properties, heat treatments and related data. Mr. Warden F. Wilson, General Sales Mgr., **Lebanon Steel Foundry**, Lebanon, Pennsylvania. **L-17**

Bandsaw Tires

Folder illustrates company's molded rubber tire with steel backbone made to fit any bandsaw wheel; outlines advantages and gives complete production and application data. **Carter Products Co.**, Grand Rapids 2, Mich. **L-18**

Marking Tools

Outline of uses and special features of line of standard automatic roll marking tools for screw machines contained in 4-page bulletin NM-49; includes dimensional drawings, installation and operating instructions. **New Method Steel Stamps, Inc.**, 147 Joseph Campau, Detroit 7. **L-19**

Dust Prevention

Folder explains features and use of protective finish for concrete floors to prevent "dusting" injurious to machinery and personnel, while making floors harder, resistant to abrasive wear, acids, water. **Stonhard Co.**, 500 Stonhard Bldg., Dept. TE, 1306 Spring Garden St., Philadelphia 23. **L-20**

Bearing Care

"Installation, Maintenance, Removal of Anti-Friction Bearings" gives comprehensive coverage of bearing care for shop procedure maintenance practice; details on types, cleaning, lubrication, storage. **The Anti-Friction Bearing Distributors' Assoc.**, 1900 Euclid Bldg., Cleveland 15. **L-21**

Cylinders

Illustrated bulletin CS 248 describes use of hydraulic actuating cylinders for removal of mold cores from fresh concrete pipe during production. **Ledeen Mfg. Co.**, 1600 S. San Pedro St., Los Angeles 15. **L-22**

Dust Control

"Controlling Dust in Industrial Plants" gives detailed information on company's dust control system and points out savings possible in specific fields. **Aquadyne Corp.**, 220 E. 42nd St., New York 17. **L-23**

Identification

Folder 49-14 describes and pictures embossed or stamped metal piping and valve identification tags in color code recommended by National Safety Council. **Jas. H. Matthews & Co.**, 3942 Forbes St., Pittsburgh 13. **L-24**

Carbide Tools

Four-page bulletin describes tungsten carbide and cast alloy tipped tools, plus price schedule on standard tools tipped with various trade alloys; includes carbide tipped cutters, dies and ware parts, form tools, industrial diamond tools. **Corundum Company, Inc.**, Dept. U, 1777 E. 85th St., Cleveland 6. **L-25**

Electrodes

Sixteen-page electrode catalog EW-149 contains decription, data on application, welding procedure, mechanical properties and specifications of electrodes in Hobart line. **Hobart Brothers Co.**, Box EW-149, Troy, Onio. **L-26**

Lock Nuts

Illustrated folder presents case histories of two users of company's lock nuts; drawings show action. **The Palnut Co.**, 61 Cordier St., Irvington, N. J. **L-27**

Cylinders, Hydraulic (Oil)

Bulletin 49-55 pictures hydraulic (oil) cylinders with cross sectional and diagramatic drawings and photos accompany description and specification tables. **Vickers, Inc.**, 1400 Oakman Blvd., Detroit 32. **L-28**

Milling and Grinding

Catalog No. M-1684 covers line of mill-ing, broaching, cutter sharpening, grinding and lapping machines plus material flame hardening and cutting fluid; includes illustrations and specifications. **Cincinnati Milling and Grinding Machines, Inc.**, Cincinnati 9. **L-**

Pins

Catalog explains working principles, special features, general specifications and types of pins that lock; widely illustrated by Photos, dimensional and specification drawings and tables. **The Driv-Lok Pin Co.**, Sycamore, Ill. **L-3**

Metallurgy

Metallurgy bulletin aids user of industrial castings in selecting proper metals and alloys; includes physical and chemical properties, general descriptions, metallographical plates, suggested applications and other detailed data. Request on company letterhead to **Hunt-Spiller Mfg. Corp.**, 3 Dorchester Ave., South Boston 27, Mass. **L-**

Shafts and Grinders, Flexible

No. 50 Wyco catalog contains information on company's flexible shafts and grinders; introduces machines giving illustrations and operating data; explains details on grinding, sanding, wire brushing, polishing, deburring and other operations. **Wyzenbeek & Staff, Inc.**, 834 W. Hubbard St., Chicago. **L-32**

Screw Machine Products

Folder, SMP, pictures line of high speed precision machines with special applications for manufacturers of screw machine products, outlining advantages in speed, operation and cost reduction. **Hardinge Brothers, Inc.**, Elmira, N. Y. **L-**

Aluminum Welding

Form Eu-31 gives properties and advantages of recently developed alloy for aluminum welding; includes procedural and technical data and useful list of alternate alloys for welding aluminum sheet to other metals or alloys. **Eutectic Welding Alloys Corp.**, 40 Worth St., New York 13. **L-34**

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ansas City Students ponsor Jet Program

Lawrence, Kan.—The University of nsas student section of Kansas City apter was host March 8 to approxi- ately 125 engineering students, a group faculty members, and 57 tool engineers m the parent chapter. Three speak- from the Kansas City plant of West- house Electric Corp. presented an tstanding program on jet engines.

Chairman John Hoover opened the eting with a gavel made of walnut m the first campus building. The vel was a gift from the Department of op Practice.

Program Chairman George Hopkins t introduced Samuel S. Stine, man- r of the local Westinghouse plant, o described the 19XB jet engine used the Phantom—the first jet plane to ke carrier landings.

As he showed slides illustrating some the fixtures used, the speaker em- asized the need for tool engineers able of designing jigs and fixtures high production.

Richard T. Nalle, Jr., of the Westing- use sales and order service department, cussed the use of these engines in the vy fighter Phantom and the Air Force hter XF-88. Two color films of these nes were shown.

The third speaker captured the in- est of every engineering student pres- . George M. Nicholson, manager of dustrial relations, spoke on "Job Op- rtunities." His plant, Mr. Nicholson plained, needs manufacturing rather n design men.

The three-hour program closed with estions from the floor.

During a business meeting earlier in e evening, Howard Lebo, newly-elected airman of Kansas City chapter, was troduced.

oover Is Chairman

At their February meeting the students augurated three newly-elected officers: hn Hoover, chairman; Charles Inder- esen, secretary-treasurer; and H. W. ddenbohm, parliamentarian. Ralph drea, retiring chairman, opened the eeting and expressed appreciation for e cooperation of the group during his ministration. Howard Rust, faculty visor for the ASTE group, introduced r. Hoover, who presented his staff.

During the evening, Mr. Andrea dis- ssed plans for a tour of the Black, valls & Bryson Co. plant. Mr. Hoover ported on expected job opportunities th Kansas City firms.

Technical speaker was Leonard J. dowski of the Kirk-Wikland Co., Kan- s City, who spoke on "Application of ardfacing." Mr. Sadowski commented a short film, "Hardfacing of a Plow- are," and discussed the metallurgy of e facing materials.

Election of officers was the principal siness at the previous meeting. Two ms were shown. The first, "Tooling for t Propulsion," concerned broaching; e second, "A Tale of Two Cities," picted atomic bomb devastation.

Thomas J. Donovan, Jr., ASTE director from Philadelphia, congratulates Wayne Ewing after swearing him into office as chairman of Los Angeles chapter. Mr. Donovan, who operates a heat treat firm, also was technical speaker at the installation night.

Tool, Aeronautical Men Hear Heat Treat Expert

Los Angeles, Calif.—Uniformity is the key to successful heat treating, according to T. J. Donovan, Jr., national director of ASTE and owner of Donovan Co., Philadelphia, Pa.

In a talk before 106 members and guests of Los Angeles chapter at the Institute of Aeronautical Sciences, March 9, Mr. Donovan converted what could have been a dry subject into an interesting and humorous presentation of "Heat Treating Practice." He delighted in ribbing designers and die makers who build sharp fillets and thin walled sections into products to be heat treated. Such practice, he emphasized, prevents uniform heating.

Two portable microphones permitted the audience to ply the speaker with questions. Among points developed in the discussions were: The ideal, all-around case or carburize steel is SAE 2315; best plastic die steel is SAE 4620. Quenching on a rising temperature gives maximum hardness. "Soft spots" in case hardened steels can be obtained by painting with a copper sulphide paint.

The speaker believes that sub-zero treatment of steel is of no value if the part has been properly heat treated.

Coffee speaker was Fred Naumetz, captain and center of the Los Angeles Rams professional football team. Motion pictures of the highlights of the Rams' 1949 season were shown at the conclusion of Mr. Donovan's talk.

Mr. Donovan also conducted the installation of new officers headed by Wayne Ewing as chairman.

Snyder Honored by Firm He Founded 25 Years Ago

Detroit, Mich.—Clarence Snyder, founder and chairman of the board, Snyder Tool & Engineering Co., received a 25-year diamond service pin at the company's recent Silver Jubilee and annual Snyder Family Party.

The presentation was made to the Detroit chapter ASTE'er by Howard N. Maynard, Snyder president, in the presence of 600 employees and their families. A number of other staff members also received service pins.

Coming Events

CENTRAL PENNSYLVANIA—May 18. Ladies Night. Program to be announced.

CHICAGO—June. Golf and picnic. Date and details to be announced.

CLEVELAND—May 12. Speaker: J. E. Wallace, superintendent, machine design application, Reliance Electric & Engineering Co. Subject: "Latest Developments in Variable Speed Controls for Machine Tools." Coffee speaker: Wayne Mack, production manager, Radio Station WGAR. June 9. Annual golf party, Manakiki Country Club.

DETROIT—May 11. Dinner 6:30 p.m., meeting 8:00 p.m., Rackham Bldg. Speaker: E. N. Cole, works manager, Cadillac Motor Car Div., General Motors Corp., Detroit. Subject: "Processing and Tool Engineering." June 8. Subject: "Carbides, Cast Alloys, High Speed Steels and Their Place in Industry."

ERIE—June 24. All-day picnic at General Electric picnic grounds.

FAIRFIELD COUNTY—May 10. Stratfield Hotel, Bridgeport, Conn. Subject: "Design and Manufacture of Fine Pitch Gears," sponsored by Eastman Kodak Co.

INDIANAPOLIS—June 3. Annual picnic, Forest Park, Noblesville, Ind. Golf, horseshoes, games, refreshments. Reservations close May 28.

NEW HAVEN—May 11. Speaker: Phillip McKenna, president, Kennametal, Inc. Subject: "Carbides." June. Outing, details to be announced.

PHILADELPHIA—May 18. Speaker: W. J. Williams, American Pulley Co. Subject: "Power Transmission." June 10. Annual outing, Philadelphia Rifle Club.

TWIN STATES—May 10. Springfield, Vt. Speaker: J. I. Karash, Reliance Electric & Engineering Co., Cleveland.

WATERLOO AREA—May 24. Subject: "Uses and Abuses of Drills, Reamers and Taps," sponsored by Cleveland Twist Drill Co. June. Stag golf party at Plymouth Country Club.

Atlanta T.E.'s, Wives See Weideman Installed

Atlanta, Ga.—Atlanta members entertained their ladies March 24 at the Horseshoe Supper Club. The 43 ASTE'ers and women guests attending the function looked on as James C. Cogburn, a past chairman, installed the officers for the coming year.

Taking the oath of office were: James F. Weideman, chairman; C. E. Redfern, first vice-chairman; M. W. Kemp, second vice-chairman; F. F. Ford, secretary; and Harry K. Grant, treasurer.

The occasion was also a homecoming for Mr. Cogburn, who has been in South America on business for nearly a year.

During the evening a Miss Von Dulaney entertained with piano and accordion.

Directory of A.S.T.E. Chapter Chairmen

AKRON, NO. 47
Second Monday*
L. W. Kuttler, Jr., *Chairman*
1089 Orlando Ave., Akron, O.

ATLANTA, NO. 61
Third Monday*
James F. Weideman, *Chairman*
Box 83, Lithonia, Ga.

BALTIMORE, NO. 13
First Wednesday*
Robert D. Brickett, *Chairman*
2804 Louise Ave.
Baltimore 14, Md.

BINGHAMTON, NO. 35
Wed. after 1st Mon.*
George H. Conine, *Chairman*
1 Mather St., Apt. 10
Binghamton, N.Y.

BOSTON, NO. 33
Second Thursday*
Anselm J. Leone, *Chairman*
6 Trafford St., Quincy, Mass.

BUFFALO-NIAGARA FRONTIER, NO. 10
Second Wednesday*
Philip C. Richardson, *Chairman*
24 West Ave., Newfane, N.Y.

CEDAR RAPIDS, NO. 71
Third Wednesday*
Elliott H. Wheeler, *Chairman*
2007 Franklin N. E.
Cedar Rapids, Iowa

CENTRAL PENNA., NO. 22
Third Thursday*
Woodrow W. Faw, *Chairman*
241 Jefferson Ave., York, Pa.

CHICAGO, NO. 5
Second Tuesday*
Thomas C. Barber, *Chairman*
Tool Service for Industry
140 N. Dearborn
Chicago 2, Ill.

CINCINNATI, NO. 21
Second Tuesday*
George F. Bradley, *Chairman*
1316 Carolina Ave.
Cincinnati 29, Ohio

CLEVELAND, NO. 3
H. B. Osborn, Jr., *Chairman*
3800 Harvard Ave.
Cleveland, Ohio

COLUMBUS, NO. 36
Second Wednesday*
Thomas F. Starkey, *Chairman*
323 Chatham Rd.
Columbus 2, Ohio

DAYTON, NO. 18
Second Monday*
C. Russell Miller, *Chairman*
4114 Daleview Ave.
Dayton 5, Ohio

DECATUR, NO. 58
Last Thursday*
Frank G. Miller, *Chairman*
1503 N. Water, Decatur, Ill.

DENVER, NO. 77
First Wednesday*
Willard G. Axtell, *Chairman*
1269 Madison Ave.
Denver 6, Colo.

DES MOINES, NO. 80
Third Wednesday*
John M. Speck, *Chairman*
2701 High St.
Des Moines, Iowa

DETROIT, NO. 1
Second Thursday*
C. M. Smillie, Jr., *Chairman*
1100 Woodward Hgts. Blvd.
Ferndale 20, Mich.

ELMIRA, NO. 24
First Monday*
Mads H. Kristensen, *Chairman*
Bird Creek Rd., R.D. 1
Pine City, N.Y.

ERIE, NO. 62
First Tuesday*
Stanley S. Sadoski, *Chairman*
520 E. 8th St., Erie, Pa.

EVANSVILLE, NO. 73
Second Monday*
Walter V. Stippler, *Chairman*
816 N. 9th Ave.
Evansville 12, Ind.

FAIRFIELD COUNTY, NO. 6
First Wednesday*
Thomas E. Hogan, *Chairman*
74 Lenox Ave.
Glenbrook, Conn.

FOND DU LAC, NO. 45
Second Friday*
W. H. Jorgensen, *Chairman*
1132 14th Ave.
Green Bay, Wis.

FORT WAYNE, NO. 56
Second Wednesday*
James L. Brant, *Chairman*
340 W. Sherwood Terrace
Fort Wayne, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday*
G. M. Waller, *Chairman*
810 N. Lincoln Ave.
Geneva, Ill.

GOLDEN GATE, NO. 28
Third Tuesday*
Al Minetti, *Chairman*
1948 Vallejo St.
San Francisco, Calif.

GRAND RIVER VALLEY, NO. 81
Third Tuesday*
Harry H. Whitehall, *Chairman*
15 Havill St., Galt, Ont., Can.

HAMILTON, NO. 42
Second Friday*
George H. Churchill, *Chairman*
9 Huron St.
Brantford, Ont., Can.

HARTFORD, NO. 7
First Monday*
Donald B. Huntting, *Chairman*
26 Canal St.
Windsor Locks, Conn.

HOUSTON, NO. 29
Second Tuesday*
T. J. Gilchrist, *Chairman*
113 Ashburn
Houston 17, Texas

INDIANAPOLIS, NO. 37
First Thursday*
Reinhold F. Krause, *Chairman*
6176 Caroline Ave.
Indianapolis 20, Ind.

KANSAS CITY, NO. 57
First Wednesday*
William H. Lebo, *Chairman*
4522 Olive St.
Kansas City 4, Mo.

LEHIGH VALLEY, NO. 83
Third Friday*
Eugene A. Pelizzoni, *Chairman*
923 N. St. Elmo St.
Allentown, Pa.

LITTLE RHODY, NO. 53
First Thursday*
Francis H. Cary, *Chairman*
9 Codding St., Providence, R.I.

LONG BEACH, NO. 84
Second Wednesday*
John H. Stansbury, *Chairman*
231 Nieto Ave.
Long Beach, Calif.

LOS ANGELES, NO. 27
Second Thursday*
Wayne Ewing, *Chairman*
9700 Bellanca Ave.
Los Angeles 45, Calif.

LOUISVILLE, NO. 54
Second Wednesday*
Sauter F. Reichert, *Chairman*
1026 Logan St.
Louisville 4, Ky.

MADISON, NO. 75
W. R. Carnes, *Chairman*
2066 Helena St.
Madison 4, Wis.

MID-HUDSON, NO. 74
Second Tuesday
Ellis W. Thorp, *Chairman*
380 Mill St.,
Poughkeepsie, N.Y.

MILWAUKEE, NO. 4
Second Thursday*
Herbert G. Heimann, *Chairman*
1607 N. 52nd St.
Milwaukee 8, Wis.

MOHAWK VALLEY, NO. 78
Fourth Tuesday*
Frederick L. Barker, *Chairman*
35 Spring St., Ilion, N.Y.

MONTREAL, NO. 50
Second Thursday*
Samuel Pedvis, *Chairman*
5212 Grenier Ave.
Montreal, Que., Can.

MUNCIE, NO. 70
First Tuesday*
Arthur F. Kurtz, *Chairman*
2910 S. Jefferson St.
Muncie, Ind.

NASHVILLE, NO. 43
Fourth Friday*
Fred D. Wright, *Chairman*
316 Howerton St.
Nashville 6, Tenn.

NEW HAVEN, NO. 41
Second Thursday*
Michael J. Radecki, *Chairman*
277 Chapel St.
New Haven 5, Conn.

NEW ORLEANS, NO. 60
Information not available

NEW YORK, GREATER, NO. 34
First Monday*
Carl Kertesz, *Chairman*
80 Washington St.
New York 6, N.Y.

NIAGARA DISTRICT, NO. 65
First Thursday*
C. C. Bradford, *Chairman*
153 Pleasant St.
St. Catharines, Ont., Can.

NORTH TEXAS, NO. 51
Irving H. Buck, *Chairman*
1901 Canton St.
Dallas 1, Texas

NORTHERN NEW JERSEY, NO. 14
Second Tuesday*
Albert J. Schmidt, *Chairman*
49 Hinrichs Pl.
Bloomfield, N.J.

PEORIA, NO. 31
First Thursday*
Robert W. Bayless, *Chairman*
R.R. 2, Chillicothe, Ill.

PHILADELPHIA, NO. 15
Third Thursday*
Leroy S. Paulsen, *Chairman*
Manheim Gardens, Apt. 10B
Manheim and Schuyler Sts.
Philadelphia 44, Pa.

PIEDMONT, NO. 82
Second Monday*
Jacob D. Schiller, *Chairman*
814 Madison Ave.
Winston-Salem, N.C.

PITTSBURGH, NO. 8
First Friday*
Gaylord C. Wood, *Chairman*
814 Clark Bldg.
Pittsburgh 22, Pa.

PONTIAC, NO. 69
R. E. Lawrence, *Chairman*
94 Dixie Ave.
Pontiac 18, Mich.

PORTLAND (MAINE), NO. 46
Fourth Friday*
Howard W. Stevens, *Chairman*
S. D. Warren Co.
Cumberland Mills, Me.

PORTLAND (OREGON), NO. 63
Third Thursday*
Charles A. Magee, *Chairman*
3020 S. E. Yamhill
Portland 15, Ore.

POTOMAC, NO. 48
Information not available

RACINE, NO. 2
First Monday*
George F. Tigges, *Chairman*
1751 Orchard St., Racine, Wis.

RICHMOND, NO. 66
Second Tuesday*
M. E. Culbertson, *Chairman*
821 Northwest C St.
Richmond, Ind.

ROCHESTER, NO. 16
First Monday*
Emmett W. Moore, *Chairman*
156 Burlington Ave.
Rochester 11, N.Y.

ROCKFORD, NO. 12
First Wednesday*
George H. Rigeman, *Chairman*
610 15th Ave., Rockford, Ill.

SAGINAW VALLEY, NO. 68
Third Thursday*
B. Phillips, Jr., *Chairman*
2201 Sheridan Ave.
Saginaw, Mich.

ST. LOUIS, NO. 17
First Thursday*
Emil Stempfle, *Chairman*
5970 Pamplin Ave.
St. Louis, Mo.

SALT LAKE CITY, NO. 85
Leslie C. Seager, *Chairman*
1194 Crystal Ave.
Salt Lake City 6, Utah

SAN DIEGO, NO. 44
Second Tuesday*
Elmer G. Gray, *Chairman*
305 San Elijo St.
San Diego 6, Calif.

SCHENECTADY, NO. 20
Second Thursday*
Charles Lamb, *Chairman*
205 Wyman St.
Scotia 2, N.Y.

SEATTLE, NO. 39
Second Tuesday*
James C. Smith, *Chairman*
4532 20th N. E.
Seattle 5, Wash.

SOUTH BEND, NO. 30
Second Tuesday*
John C. Yoder, *Chairman*
514 E. Ewing Ave.
South Bend 14, Ind.

SPRINGFIELD (ILL.), NO. 64
Information not available

SPRINGFIELD (MASS.), NO. 32
Second Monday*
Wendell T. Ingham, *Chairman*
110 Ingham St.
Willimansett, Mass.

SPRINGFIELD (OHIO), NO. 76
Roger L. Horstman, *Chairman*
309 Glendale Dr.
Springfield, O.

SYRACUSE, NO. 19
Second Tuesday*
Herbert D. Mozeen, *Chairman*
314 W. Fayette St.
Syracuse 1, N.Y.

TOLEDO, NO. 9
Fourth Wednesday*
R. C. W. Peterson, *Chairman*
Toledo Factories Bldg.
Toledo 2, Ohio

TORONTO, NO. 26
Information not available

TRI-CITIES, NO. 23
First Wednesday*
Jesse L. Howe, Jr., *Chairman*
2512 32nd St.
Rock Island, Ill.

TWIN CITIES, NO. 11
First Wednesday*
Loren C. Blanchar, *Chairman*
818 Wayzata Blvd.
Minneapolis 3, Minn.

TWIN STATES, NO. 40
Second Wednesday*
Herbert H. Ranney, *Chairman*
31 Clough Ave., Windsor, Vt.

WATERLOO AREA, NO. 79
Third Wednesday*
Glenndon G. Hilge, *Chairman*
1362 Jewett St.
Ann Arbor, Mich.

WESTERN MICHIGAN, NO. 38
Second Monday*
Clinton L. Fritz, *Chairman*
1544 Hall S.E.
Grand Rapids 6, Mich.

WICHITA, NO. 52
Second Wednesday*
Emanuel Pitsch, *Chairman*
2315 Menlo Dr.
Wichita 9, Kansas

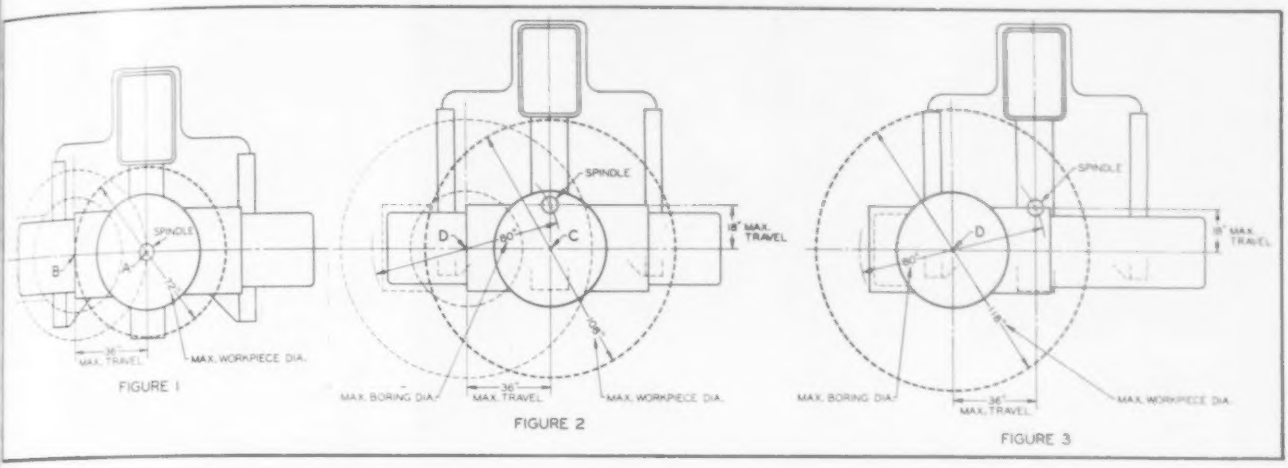
WILLIAMSPORT, NO. 49
Second Monday*
William E. Belknap, *Chairman*
1028 High St.
Williamsport, Pa.

WINDSOR, NO. 55
Second Monday*
William F. Tyson, *Chairman*
2205 Hall St.
Windsor, Ont., Can.

WORCESTER, NO. 25
First Thursday*
Carroll L. Morse, *Chairman*
21 Roxbury St.
Worcester 2, Mass.

TOOLS OF TODAY

Built-In Rotary Table for Jig Borer



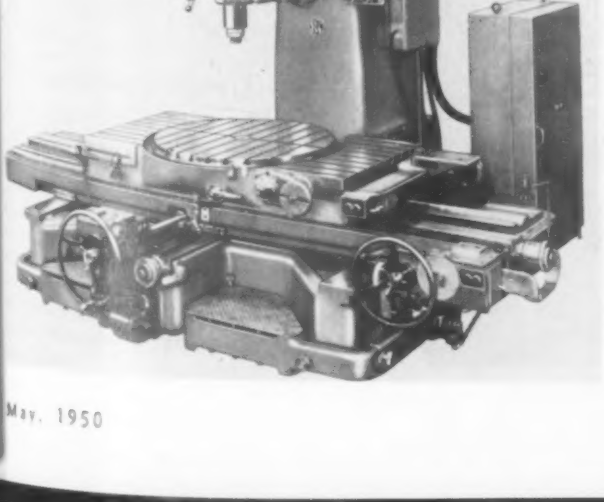
A recent design in jig borer tables, available only on their late model No. 4E Jig Borer, is announced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. The versatile work table of this machine provides a large rectangular work area with ample T-slots for holding down work, as well as a precision built-in rotary table for circular indexing and polar co-ordinate work. The overall rectangular dimensions of the table measure 36 x 78 in. and the rotary table is 48 in. in diameter.

To provide the maximum rotary work range for which the No. 4E Jig Borer is capable, the center of the rotary table is located 6 in. off center to the left in the rectangular table. This offset increases table travel between machine spindle and rotary table centerlines from 30 to 36 in., when traversed to the left. When the rotary table is centered under the spindle, as shown at point "A" in Fig. 1, the maximum workpiece diameter that will clear the machine column is 72 in.

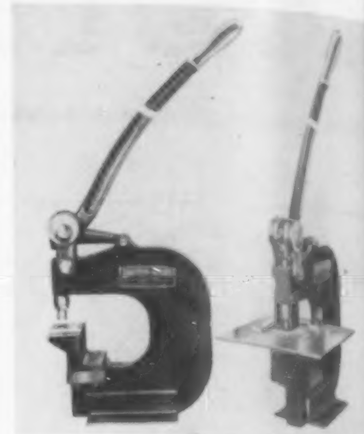
Boring can be accomplished on any diameter of this workpiece, from 0 to 72 in., by traversing the table to the left. Moving the center of the rotary table outward from the spindle centerline to point "C" in Fig. 2, a maximum workpiece of 108 in. in diameter can be accommodated and still clear the column. However, the minimum boring diameter is limited to 36 in. By traversing the table left to point "D" in Fig. 2, the boring diameter can be increased to a maximum of 80 in.

With the rotary table traversed the maximum distance from the spindle—point "D" in Fig. 3—the maximum possible work diameter that can be rotated and clear column is 118 in. Because column interference prevents further slide movement, the maximum possible boring diameter of 80 in. can not be changed unless the work piece diameter decreases.

Power rotation provides for rapid indexing. Graduations in degrees are legibly marked on a beveled edge around the entire periphery of the table for approximate indexing. Precision settings to minutes and seconds are obtained through the slow motion hand control wheel. As with all rotary tables, it is said to be extremely accurate, indexing in either direction from zero and return to the original zero with a spacing tolerance of +/— 15 seconds in the full 360 deg. of rotation. **T-5-1**



Bench Punch



No. 18 Bench Punch, by Whitney Metal Tool Co., Rockford, Ill., is a roller-bearing, lever type punch made of durable forgings and steel plate. Throat is 7 in. deep x 5 in. high—larger than ordinarily provided for punches of its size—and permits a greater range of punching operations; also, permits punching holes close to the web of an angle. Maximum capacity is a $^{13}/_{16}$ in. round hole through 12 ga. mild steel.
T-5-2

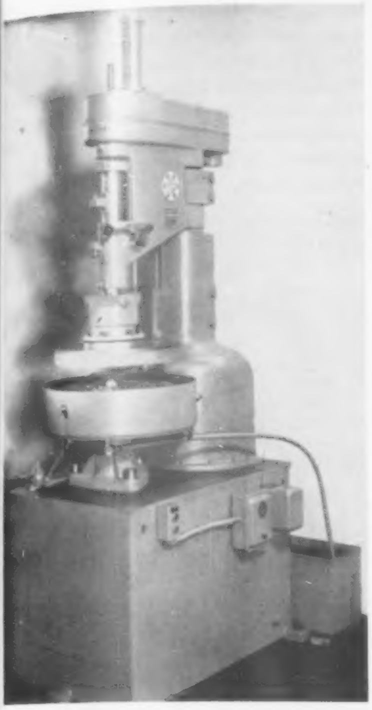
"Positionable" Tappers

Incorporating several standard Model "KT" Govro-Nelson tapping units, which can be positioned according to the parts being tapped, a Tapping Machine by Govro-Nelson Company, 1933 Antoinette, Detroit 8, Mich., can be used to perform tapping operations on several parts, tapping 2 to 4 holes simultaneously on each part. T-5-3

Hi-Temperature Oil

A light-colored, "carbon-free" high temperature lubricating oil—Safco No. 1250 Hi-Temp Oil—is announced by the Swan-Finch Oil Corp., RCA Bldg., West, New York 20, N. Y. This product, which is said to be "heat treated" for greater resistance against carbon and sludge formation, is recommended by the manufacturer for lubrication of conveyor bearings, core oven bearings and textile mill applications. T-5-4

Microflat Honer



A honing machine by Micromatic Hone Corporation, 8100 Schoolcraft, Detroit 4, Mich., is designed to hone two surfaces, simultaneously, with the faces so produced said to be flat and parallel to less than 0.00005 in.

Eliminating slow and expensive hand operations, these Microflat honing machines generate surfaces said to be flat to one light band and to any desired surface finish. Available for any size or type of surface, for use with either loose or bonded abrasives.

T-5-5

Midget Coolant Separator

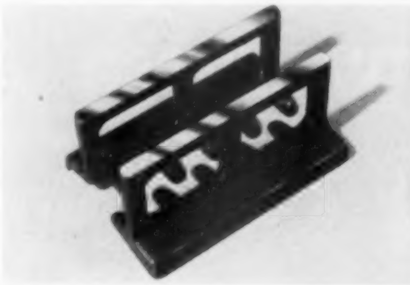
Barnes Drill Co., Rockford, Ill., announces the No. 00 Barnsdrill Magnetic Coolant Separator, a midget model designed to meet a demand for consistently clean coolant for small honing, grinding and threading machines.

Small and compact, with a capacity of 1½ gallons per minute, the unit can be placed in a coolant tank to remove metal particles and fused abrasives from the work. Constant removal of the "load" provides a uniform and constantly clean coolant supply, thus assuring a precision finish free from scratches.

T-5-6

Nesting Parallels

A lightweight tool and die makers parallel—the Magic Parallel—is being marketed by Montgomery & Co., 53 Park Place, New York, N.Y. Precision ground to 0.0005 in. in their full length of high grade semi-steels, this combination is particularly useful in tool and die work. Simply by laying a die shoe or a punch holder on the parallels, the operator has ready access for drilling, assembling and inspecting.



Light enough to carry with the work from machine to bench, the hollow construction makes it easy to grip. They are non-tip, narrow, rugged, and can be closed completely. Available in 5 sizes, up to 24 in. long and 16 in. high. In non-rusting black crackle finish. **T-5-7**

Millers by Cincinnati

The illustration shows, better than words, the rugged design and nicety of engineering of the recently announced No. 3MI Milling Machine, by Cincinnati Milling Machine Company, Cincinnati 9, Ohio. This machine, which is an extension of the Cincinnati Nos. 2ML and 2MI millers, is offered in both plain and universal types.

Provided with wide speed and feed rates—60 to 1 and 120 to 1, respectively—the machine covers requirements for all types of milling operations encountered in the metal-working industries. These wide ratios, coupled with the rapidity and ease with which speeds may be changed, constitute two of the major qualifications for tool room milling.

Sixteen spindle speeds, ranging from 25 to 1500 rpm, are changed with a single crank control by which, through a selector valve, the gearshift is performed hydraulically. A safety interlock precents the speed change crank from being moved while the spindle is rotating. Spindle rotation may be reversed to suit the "hand" of a cutter without affecting the direction of feed. Feed rates are changed in the same manner as speeds through the complete range of 16 feeds—that is from ¼ in. to 30 in. per minute.

These are but a few of the features of this miller, which is completely described in a comprehensive bulletin available from the company on request.

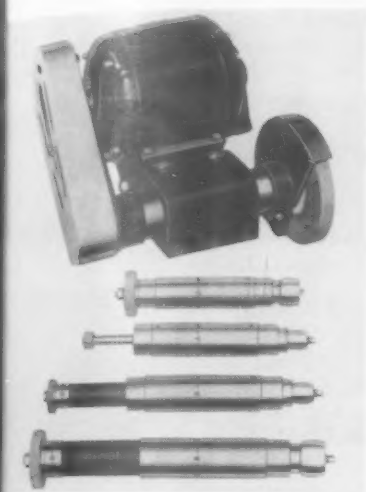
T-5-8

Protective Bags

The Munson Bag Co., 1332 W. 117th St., Cleveland 7, Ohio, announces plastic-laminated Moisture-proof Bags designed to protect machined surfaces, tools and delicate control or indicating instruments while in storage or transit. They are available in a wide range of sizes and in a variety of combinations to meet individual requirements. Can be furnished fabricated from Polyethylene only, or laminated to foil or kraft, or laminated to cloth-back foil. In addition, the bags can be supplied with printed trade marks, serial numbers, parts numbers and shipping instructions. **T-5-9**

Precision Grinding Spindles

The Maxwell Company, 250 Broadway, Bedford, Ohio, announces a line of precision Grinding Spindles for use on all standard types of grinders. Featuring Fafnir bearing construction throughout, these spindles are designed to facilitate high speed precision grinding operations.



The upper spindle shown in the photograph is designated type "H", and is designed especially for external grinding applications. The three lower spindles—types H-3, H5-1½, and H5-2—perform a wide variety of internal grinding operations. Dimension "A" of all spindles shown is 2⅛ in.; however, this dimension can be varied to meet the specific requirements of almost any grinder in use today.

Spindle "H" has grinding speed of approximately 3450 rpm, when harnessed to normal power source, while the other three types can operate at speeds up to 30,000 rpm to meet individual job requirements.

All or any one of these spindles can be furnished as standard equipment on a recent line of type "HE" precision grinders now being manufactured by the Maxwell Company. This grinder has been designed specifically for attachment to engine lathes, and other machine tools, to facilitate precision external and internal surface finishing operations. Catalog No. 1041 gives complete information and specifications.

T-5-10

Hardening Compound

A Hardening Compound for steel, by Doughty Laboratories, Inc., 299 Madison Ave., New York 17, N. Y., is said to increase tool life by several hundred per cent. Called Hard'N'Tough, the product is a chromium-carbon compound which combines nitriding, carburizing and chromizing in one short and simple operation.

Recommended by the maker for use on all types of tools, parts, dies and other low carbon or high speed steel materials, as well as on mining, drilling and farm machinery. Said to contain no cyanide or other toxic materials. **T-5-11**

Flame Hardened Chucks

E. Horton & Son Company, Windsor Locks, Conn., now offers optional flame hardened jaw ways on the body of their "S" line of Lathe Chucks.

Because the jaw ways are the most vulnerable wear point of chucks, flame-hardening not only greatly extends the life of the chuck as a whole but also tends to maintain accuracy over a considerably longer period of time.

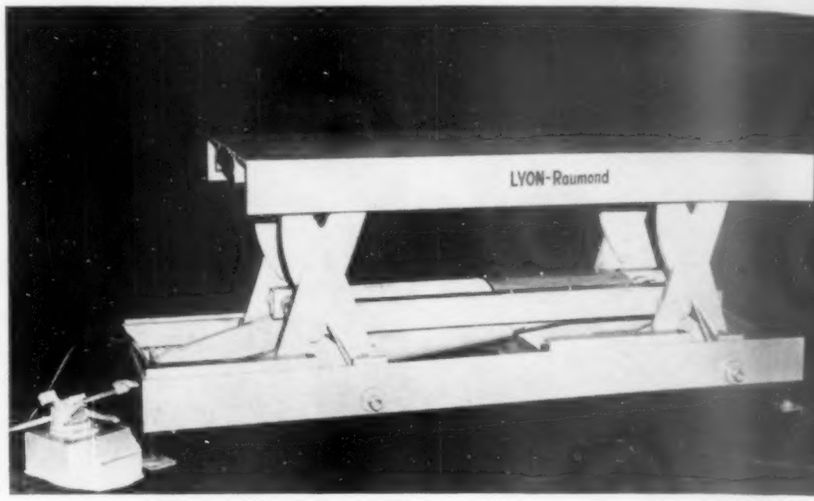
Other features of these chucks include hardened and ground replaceable pinion bushings, grease fittings and wider top jaws. **T-5-12**

Elevating Table

Exceptionally low height and a greater range of elevation is claimed for the compound lever arrangement in a hydraulic Sheet Feeding Table by Lyon-Raymond Corporation, 9767 Madison St., Greene, N. Y.

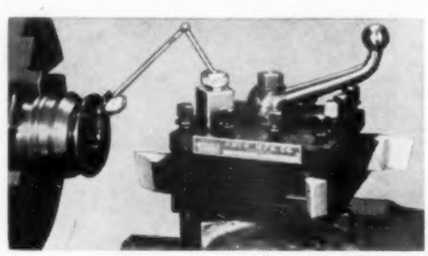
A standard model No. 1196 is available with a capacity of 10,000 lbs. The range of elevation is from 12 to 36 inches, thus providing a total lift or 24 inches. The platform is 36 in. wide by 96 in. long; however, end and side extensions are available to increase the platform area.

The table also features a vertical lifting arrangement and the manufacturer stresses the point that there are no uprights extending above the platform to stand in the way of overhanging material. The table can be furnished with wheels and casters to make a portable unit with a lowered height of 20 inches. T-5-12



Magnetic Base Tools

Enco Manufacturing Company, 4522-24 W. Fullerton Ave., Chicago 39, Ill., exhibited their Miti-Mite group of magnetic base indicator holders and magnetic base "Handi-Lites"—two products that have wide applications—at the ASTE Show. The V-block base con-



struction allows them to be mounted on both flat or convex surfaces, such as a milling machine arbor where is may be used as a sweep indicator. Ideally suited for use on machine tools, or any application where a fixed indicator is required.

An outstanding feature of both products is the universal ball and socket and swivel construction which permits either to be used at almost any conceivable angle. The photo shows Miti-Mite Indicator Holder mounted on square turret in a lathe, eliminating any need to disturb setup to true up work. The complete line of Enco turret tool posts, Hexturrets and tailstock turrets were on display at booth No. 303. T-5-14

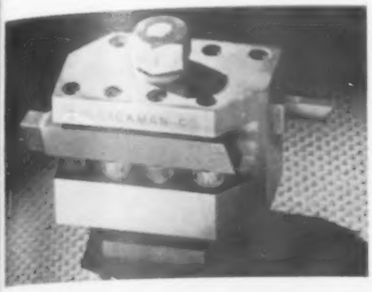
USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Non-Scaling Compound

Used in hardening and annealing of steel, Phoenix Brand Non-Scaling Compound is said to virtually elimiate decarburization, scaling, pitting, surface film and excessive discoloring during heat treating processes. It is a powder, —not a salt solution—suited for use in any type furnace except the bath type. This compound is a product of the Parker Stamp Works, Inc., 600 Franklin Ave., Hartford, Conn. T-5-15

Two-Way Tool Holder

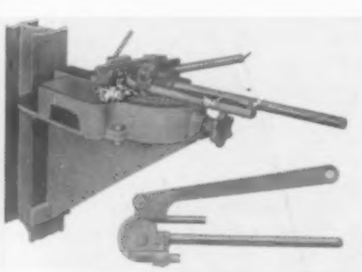
A Tool Holder for lathes, by W. H. Sackman Co., Inc., 44 N. Fourth St., Philadelphia 6, Pa., is designed to hold, rigidly, wide tools on comparatively narrow bases with complete absence of chatter.



The holder mounts two tools and, by swinging end for end, most lathe operations such as threading, forming and cutting-off can be performed. A series of adjustable posts accommodate tools of different sizes and permit further adjustment as tools wear and are resharpened. Currently available for 9 to 16 in. lathes. **T-5-16**

Economy Tube Benders

A line of Tube Benders, by Republic Mfg. Co., 1930 West 77th St., Cleveland 2, Ohio, is designed for production or intermittent tube bending. Three models are included, of which a bench bender covers a range from 3/8 in. to 1 1/4 in.



Two models of the hand benders—Nos. 38 and 39—cover ranges 1/4 to 1/2 in. and 3/8 to 3/4 in. respectively. Tubing of soft copper, brass, aluminum, or fully annealed steel may be bent to desired angles, and shapes may be bent with special radius blocks. **T-5-17**

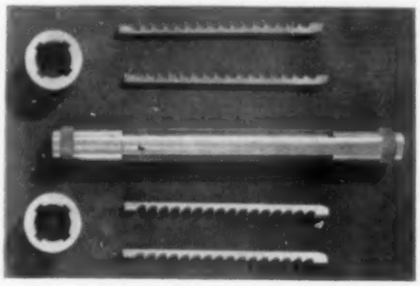
Plastic-Metal Compound

A Casting Compound, said to be neither a metal nor a plastic, yet partakes of the qualities of both, is announced by the Plastics Division of the Lockrey Co., College Point 3, N. Y. Called Plasti-Metl, this material is the color of copper, is said to be harder than some casting metals, yet can be poured into molds at room temperature.

With the aid of varying amounts of a catalyst, it can be made to set at room temperature without heat, or in an oven at low temperatures to form a hard, tough, metallic-like casting that can be machined or polished with ordinary tools. The material, as well as descriptive literature, may be obtained direct from the manufacturer. **T-5-18**

Multiple Broach

The Kase Machine Company, 18442 Buffalo Ave., Cleveland 19, Ohio, announces a special Push Broach that will cut 1, 2, 3, or 4 precision keyways in



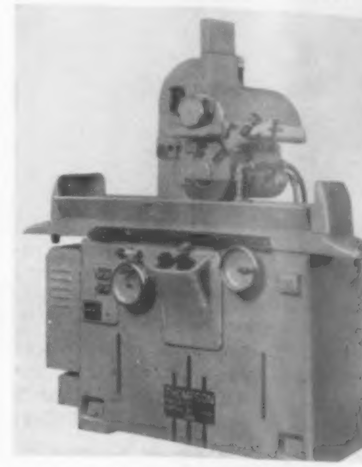
a single pass. Designated LK-4, this tool is suitable for a wide range of applications in which up to four keyways are required in a single workpiece. The milled slots in the broach body, which contain the cutting blades, are accurately located at 90 deg intervals.

The LK-4 broaches can be furnished on order in diameters from ¾ to 2½ in., and 1/32 in. increments. Blades widths range from 3/16 to ⅝ in., depending upon broach diameter. Interchangeable blades facilitate cutting of different size keyways with one tool. In addition, when blades are removed for resharpening, replacement blades can be substituted to prevent slowdown in production operations.

T-5-19

Tool Room Grinder

The Thompson Grinder Company, Springfield, Ohio, announces a superprecision tool room grinder—the Thompson Type 2F—in a 8 x 10 x 24 in. size. This larger machine supplements the smaller Thompson Type F 6 x 10 x 18 in. tool room grinder. The machine features hardened and ground sliding bearings and extremely sensitive feed screws of the ground thread type.



As can be seen from the illustration, the machine has a horizontal grinding wheel spindle and reciprocating work table grinding with the periphery of the wheel. Maximum table movement is 29 in.; traverse 8 in.; vertical 10 in. from table to underside of 12 in. diameter wheel. Width of work surface 8 in., and length of work surface 24 in. with 3 in. additional clamping surface at each end. T-slots, 3, size ⅜ in.

Spindle is of heat treated alloy steel mounted in superprecision preloaded ball bearings, permanently lubricated. It has a 3600/1800 rpm 2-speed wheel head; with grinding wheel surface speed 5400 feet per minute. Table speed, hydraulically operated, is 5 to 70 ft. per minute; hand operated, 2 in. per revolution of handwheel.

Auxiliary equipment includes coolant through the wheel; magnetic chucks and control; and universal contour devices utilizing a 10 to 1 magnified template with diamond truing tool. Specification sheets available on request, without obligation. T-5-20

Corrosion Resistant

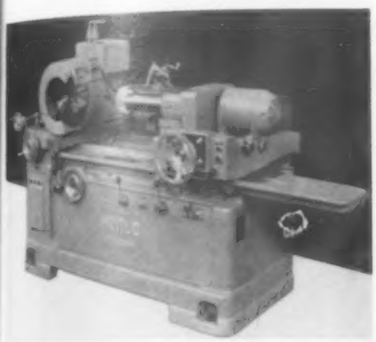
A corrosion and oxidation resistant coating, said to possess unique advantages, is announced by End-O-Rust, Inc., 1900 Euclid Ave., Cleveland, Ohio. Although created primarily for metals, the sealing power of the compound is said to adapt it with especial success for use on concrete, wood or any surface where more than normal protection is needed.

As claimed by the manufacturer, no special preparation of surface is needed, and complete protection is achieved without costly dip and heat treating methods. Quick drying, End-O-Rust is said to air dry for handling in 2 to 3 hours, force dry within 30 minutes and infra-red bake in 3 to 5 minutes.

T-5-21

Universal Internal Grinder

Announced by the Heald Machine Company, Worcester 6, Mass., is the Model 274 Universal Internal Grinding Machine. Designed for a wide variety of tool room work, the machine may be equally well applied to longer production grinding.



The workhead of this Heald Machine may be swivelled up to 90 deg, providing wide angular capacity. Hydraulically driven to provide an infinite variety of speeds within a range of 40 to 350 rpm, it will grind straight or taper holes, straight or taper O.D's and flat or convex surfaces. T-5-22

Hi-Frequency Wheel Heads

Also, Heald Machine Company has made available Hi-Frequency Wheelheads in a complete line covering the entire range of sizes and styles for internal grinding. These high frequency Red Heads—as they are called—come in eight different models covering the range from 6,000 to 100,000 rpm. The two smallest size heads have a combined range of 45,000 to 100,000 rpm and are arranged to take mounted point wheels.

The higher rpm heads are designed to fill the requirements in high speed small hole grinding beyond the practical limits of conventional belt driven heads and provide surface speeds heretofore said to be unavailable with standard type heads. T-5-23

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

"Twist-type" Masonry Drill

Kennametal Inc., Latrobe, Pa. announces a "twist-type" Masonry Drill, featuring a blade of "vacuum-sintered" cemented carbide said to be made exclusively by Kennametal.

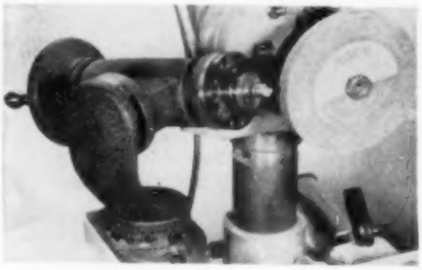
Two distinctive design features are claimed for this drill: an "angled" cutting point which practically eliminates

motionless "dead center", giving the drill greater biting power and full operating effectiveness; a "faster" spiral which cleans out dust at an accelerated rate, assuring complete hole cleaning and permitting continuous drilling without dust accumulation that overloads or stalls the power drill.

These drills fit standard rotary electric drills, and drill all forms of masonry, tile, ceramics and other non-metallic construction materials. Made in 12 sizes from 1/4 through 1 in., and in increments of 1/16 in. Packaged individually or in kits containing the five most widely used sizes. Further described in Kennametal Bulletin K-109. T-5-24

I-G-C Relief Grinder

An improved I-G-C Relief Grinder—Model 100-B by the Angle Computer Division, S & D Engineering Co., 1709 Standard Ave., Glendale 1, Calif.—



handles with equal speed and accuracy countersinks, center drills, integral pilot cutters and pilot drills, either right or left hand. Redesigned so that the working head can be set at any desired position, the attachment fits any standard grinder and handles work from 1/16 to 1 in. in diameter with standard collets.

Lift of the single cam is variable from 0.001 in. to 1/8 in. thus grinding for correct rake or clearance angle in addition to relief. Special built-in indexing pins provide faster and more accurate grinds; and adjusting pins permit 1, 2, 3, 4, 6 and 12-fluted cutter grinding. T-5-25

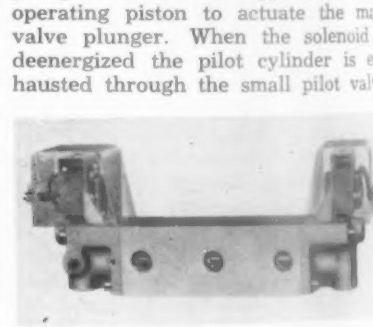
Cut-Off Band Saw

Among "cost-cutting" machines manufactured by Famco Machine Co., Racine, Wisc., is the Model "612" metal cut-off Band Saw. Described as a truly finished machine tool, it handles capacities up to 6 in. round and 6 x 12 in. rectangular stock, accommodating all shapes and types of metals. Featuring a 1/2 HP motor and a Timken roller bearing equipped transmission, the machine employs a 5/8 x 0.032 in. blade and is said to be capable of 50, 100, 175 and 300 FPM cutting speeds.

Open construction provides easy access to the work, and microset stock stop provides quick setting and precision sawing. All controls are conveniently placed within a 7 in. radius and, since the band wheels lie on the surface of the blade frame, the blade can be changed merely by dropping a new blade over the wheels and adjusting the tension. T-5-26

Solenoid Valves

C. B. Hunt & Son, Inc., Salem, Ohio, announces the "DS" line of Quick-as-a-Wink solenoid valves. These valves employ a small solenoid of only 1/8 in. stroke to move a small pilot valve plunger which in turn applies air to the operating piston to actuate the main valve plunger. When the solenoid is deenergized the pilot cylinder is exhausted through the small pilot valve.



The design is said to assure positive performance and a much greater operating force than is possible with a large direct-connected solenoid; also, because of small size and light weight, the valves can be operated at the high speeds required for production welders and other high-cycle machines.
T-5-27

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"Baltic" Vernier Caliper

Imported from Sweden and now available through the Transocean Trading Company, 6926 Melrose Ave., Los Angeles 38, Calif., the "Baltic" Vernier Caliper is designed for 0.001 in. readings on inside, outside, depth and thread measurement up to 6 in.

Made from top quality Swedish steel, all measuring surfaces are glass hard and precision ground. The sliding head carries both inside and outside jaws and the vernier scales. All figures and scales are engraved, not stamped, making the caliper a precision tool for use by inspectors and craftsmen who require extreme accuracy in close tolerance work. **T-5-28**

Dial Feed Table

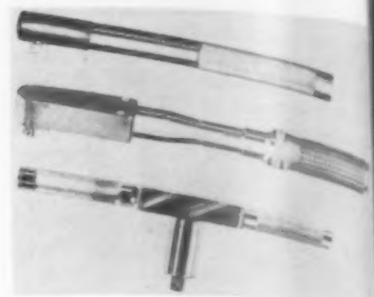
As shown by the phantom view, a Dial Feed Table, by the A. K. Allen Co. 495 Wythe Ave., Brooklyn 11, N. Y., features entirely enclosed mechanisms. Operated by an air cylinder, the standard table—here shown set for 4 stations—can be set to index 4, 6, 8, 12 or 24 stations. Baffles prevent loss of index. Fully described in a folder, available on request. **T-5-29**

A Foot Switch by Pioneer

A Foot Switch, by the Pioneer Patents & Product Co., 25 N. Franklin St., Chicago 6, Ill., gives machine operators freedom of both hands on operations requiring electrical applications. They are adapted for use with power machines, photographic enlargers, recorders and other electrical devices.

Model FS-50—shown—is a standard Pioneer switch equipped with a BX clamp and is rated 12 amps at 125 V., or 6 amps at 250 V, AC or DC. A mounting bracket is furnished for securing the switch to the floor. **T-5-30**

Torque Wrenches



JO-Line Torque Wrenches, by the JO Mfg. Co., 8442 Otis St., South Gate, Calif., cover a range from 2 to 36,000 inch-pounds. Compactly designed and well balanced, these tools have no gages or dials to watch, tension breaking automatically when the proper torque value is reached. Available with micrometer adjustment over operating range, or may be ordered pre-set to any torque value. T-5-31

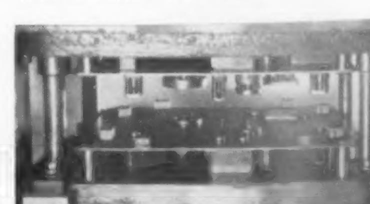
Magnetic Bit Holder

A magnetic Bit Holder for Keller pneumatic screw drivers, by Keller Tool Co., Grand Haven, Mich., keeps bits in place by magnetic attraction and also holds the screws in position for driving.

The holder—an Alnico permanent-type magnet set in a nickel steel case—was developed to speed up screw driving time, especially in recessed areas, and to eliminate tedious positioning of screws with the fingers. The magnet's attraction holds screws firmly at the bit end of the tool. T-5-32

Magnetic Perforating Dies

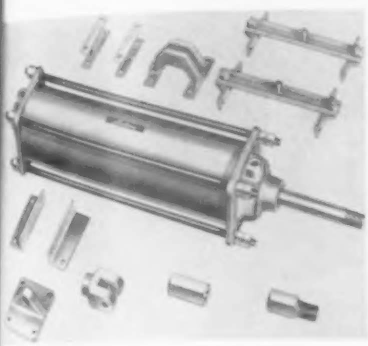
Magnetic Perforating Dies, by S. B. Whistler & Sons, Inc., 752 Military Rd., Buffalo, N. Y., are designed to effect marked savings in press down-time as well as initial tool costs.



Introduced to the public at the ASTE Cost Cutting Exposition in Philadelphia last month, where they evoked lively interest, these tools may be used for a wide range of work. Only about 20 minutes is required to change from a set up involving 25 holes or so to an entirely different job with an equal number of holes. The only die storage required is said to be two thin templets. T-5-33

Medium Duty Cylinders

A line of air and hydraulic cylinders, known as the Medium Duty Series, is announced by Ledeen Manufacturing Co., 1600 So. San Pedro St., Los Angeles 15, Calif. An addition to the line of heavy-duty and super-duty cylinders by Ledeen, these cylinders utilize tie-rod construction to give positive protection against leakage at joint of tube and head. Chevron packing seals the piston rod, and synthetic cups and automatic cushions are standard construction.



The cylinders are manufactured to standardized design and are carried in stock for immediate shipment. Various head and rod attachments provide for almost universal mounting requirements, and the three series of cylinders are said to offer an exceptionally wide selection for the consideration of original equipment manufacturers.

T-5-34

Welded Stainless Tube

A free-machining welded Stainless Tube is now available from Carpenter Steel Company, Alloy Tube Division, Union, N. J., for products that demand corrosion resistance combined with ready machinability. In line with free-machining stainless steels developed by Carpenter, the analysis is Type 303, and consists of carbon 0.08% max., chrome 17-19%, nickel 8-10%, and selenium 0.07% min.

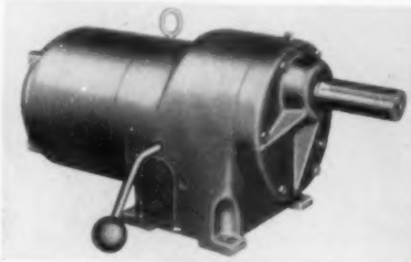
Tests on threading, rough turning, reaming, and finished machining show the tube to be as machinable as Type 303 bar stock; also, that the steel handles in automatic screw machines at about 70 per cent of the speed of SAE 1120. In addition to easy machinability and corrosion resistance, the steel has non-galling properties that make disassembly of parts easy and help to avoid scratching or galling in moving parts.

The stainless 303 tube is recommended for parts that must be fabricated by threading, turning, reaming, drilling, and similar operations, and for intricate or difficult-to-machine parts where smooth surfaces are required. Only a moderate amount of cold working is recommended because this steel work hardens rapidly. It is therefore not recommended for cold working applications such as bending, flaring, or rolling into tube sheets.

T-5-35

Gearshift Drive

The Lima Electric Motor Co., Lima, Ohio, announces the addition of the Type R3C to their line of Lima gearshift drives. This drive features a combination integrally mounted electric motor and a four-speed transmission having both primary and secondary gear reductions. The unit is designed to fill the need for a compact drive of modern design providing low, multiple output speeds.



Type R3C drives deliver full rated horsepower in each of the four speeds and both constant-torque and constant-horsepower speed motors are available on these units, which gives the increased flexibility of additional speeds.

Applications of this type of unit may be found in the individual motorization of automatic screw machines, drag conveyors, mixing equipment and installations where a low range of selective speeds, with high radial load capacity are required. T-5-36

Automatic Forming Machine

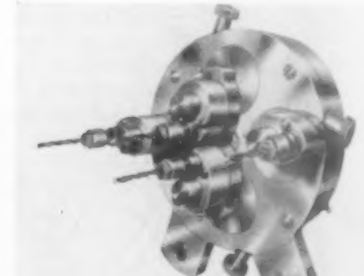
Forming operations of external grooves and shapes, as well as various end operations, can be performed on tubular or solid stock by an Automatic Machine announced by Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio. Single or double hollow, collet type spindles are available and banks of double spindle machines could be formed as production requirements dictate.

Heavy duty tool slides carry the form and end operation tools, advancing and retracting automatically by positive cam operation. When arranged as an automatic bar feed machine, a magazine stock loader can be provided. Hopper loading from the front or rear can also be furnished to meet specific needs.

The entire cycle of this machine is actuated mechanically by a single cam shaft. The geared drive of the cam shaft contained in the base has pick-off gears so that the cycle time can be readily changed to reach ultimate production with good tool life. T-5-37

Adjustable Drilling Head

Errington Mechanical Laboratory, Inc., Staten Island 4, N.Y., announces the introduction of a "fully adjustable" Drilling Head. Offering a wide range of adjustments, this tool can drill in squares, rectangles, circles, triangles and irregular patterns.



Light and compact, the head is fully geared. Spindles run in ball bearings with needle bearings where possible for closer clustering. Locks with simple finger-tip arrangement. Available in 3, 4, and 6 spindles, sizes from 3/16 in. to No. 2 MT socket capacity.

T-5-38

Shear by Baker

The Tru-Edge Shear, capable of cutting irregular shapes in either mild or stainless steel sheets up to 3/16 in. thick is now available from Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio. The shear, designed to meet the most exacting requirements, is said to shear practically any material within its capacity, such as mild steel, stainless steel, aluminum, brass, copper and magnesium. Attachment for circle cutting and strip cutting is provided and the shear may also be used to cut to a scribed line or by template.

No starting hole is required for inside cuts. By a simple exchange of hammer type dies for the cutting tools, the same machine will do diverse beading and forming operations in steel up to 1/8 in. thick. Because the machine actually shears the metal, rather than removing any, a perfectly smooth, burr-free edge results, saving costly finishing operations.

The Baker shear is made with a 48 in. throat, a variable stroke adjustment, and is powered by a 1½ HP totally enclosed ball bearing motor. The only moving parts are one roll crank, two rollers, and reciprocating top tool holder, resulting in minimization of maintenance costs and complete dependability. Includes lamp, circle cutting attachment, and one set of cutting tools. Designed for 220/440 V. 3-phase, 60 cycle.
T-5-39

Reversible Grinder Dog

Recently announced, a Dog for grinding machines has the feature of reversibility, so that the one dog will take both small and comparatively large shafts.

Drop forged, with brass tips and plates to protect the work, these dogs come in 5 sizes to accommodate capacities ¼ to 6 in. Made by Ready Tool Company, 55 Iranistan Ave., Bridgeport, Conn.
T-5-40

Foot-Powered Coolant Pump

A Coolant Supply Unit, for use with drill presses, tappers, other machine tools or bench is announced by the W. A. Horejsi Company, Dept. TTE, 2001 James Ave. North, Minneapolis, Minn.

Employing a foot-powered pump, the unit consists of a heavy steel tank holding approximately 2 gallons of lubricant or coolant. The stroke of the foot pedal controls the amount of fluid delivered to the cutting tool and, where volume demands, the coolant can be returned to the tank. Furnished with hose and mounting brackets.
T-5-41

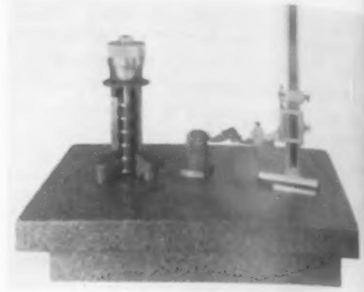
Marking Die Holder

A roll marking Die Holder, by the Parker Stamp Works, Hartford, Conn., has been developed for accurate marking of graduations on scales and other measuring tools, and for marking metal products in general with trade marks or code numbers.

Precision made of tough alloy steel, hardened, ground and honed, these holders—designated the Parker 100 Series—provide for complete interchangeability of segments, which are rigidly held because of a unique locking system.
T-5-42

Portable Pla-Check

Among checking equipment exhibited at the ASTE Show by Cadillac Gage Company, 20315 Hoover Rd., Detroit, Mich., was the 6 in. Portable Pla-Check, latest addition to the Cadillac line of checking equipment.



Designed for checking of gages, tools and dies, either on surface plate or machine, this gage is entirely self-contained and simple in operation. Accurate to 0.00005 in., the capacity of the gage can be increased by the addition of 6 in. risers which do not change its overall accuracy. T-5-43

Power Rip Feed

Announced by DeWalt Inc., Lancaster, Pa., is a Power Rip Feed attachment for radial arm saws. Designed to be attached to practically any radial arm saw, and to many under table saws, the unit may be used for straight rip sawing as well as for bevel ripping, molding, power feed shaping, ploughing, grooving, and rabbeting.

The unit, which may be moved out of the way when desired, is equipped with adjustable feed rollers for feeding material into the center and taking cut material away. The belt drive may be quickly adjusted to feed from an extremely low rate up to 120 ft. per minute. T-5-44

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Pres-Vac Safety Feeder

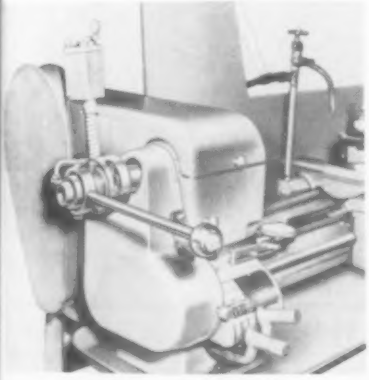
Among the many interesting exhibits at the ASTE Cost Cutting Exposition, Philadelphia, was the Pres-Vac Safety Feeder for punch presses, by the F. J. Littell Machine Company, 4201 Ravenswood Ave., Chicago 13, Ill.

This device produces a vacuum by passing compressed air through a venturi. Parts may then be picked up and placed in or removed from the die with complete safety for the operator, whose hands are never in the danger zone.

T-5-45

Collet Attachment

Bell Equipment Company, 5212 Santa Fe Ave., Los Angeles 58, Calif, announces the Waltco quick-opening and closing Collet Attachment, developed to fill a need for an efficient, low priced production type collet attachment with a 1 in. collet capacity for $1\frac{3}{8}$ in. hole-in-spindle lathes.



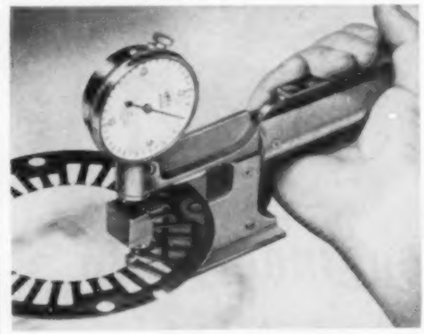
Among advantages claimed are the following; The attachment is rugged, with cam spool and fingers designed for vise-like holding power with a minimum of pressure on the actuating lever. All necessary parts are of alloy steel, properly heat treated for strength and long wear.

The attachment is adaptable and can be quickly installed on any lathe without disconnecting the gear guard. Positive adjusting mechanism is built inside the outer diameter, leaving no protruding knobs to catch clothing or cause injury to the operators. T-5-46

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Burr Gage for Stampings

The B. C. Ames Co., Waltham, Mass., introduced the Ames S-4930 Burr Gage at the ASTE Show in Philadelphia. Designed to accurately measure the height of burrs in stampings of all materials, it is particularly useful in controlling punch and die life.

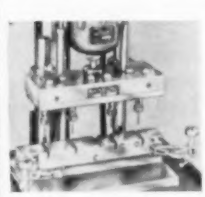


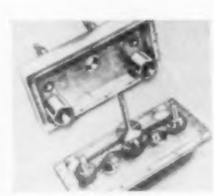
With this Ames gage, the press hand, inspector and die maker all get the same readings on the same stampings; thus, there is no guesswork as regards time for regrinding. Today, the life of many expensive carbide dies is shortened by too frequent grinding. By using the burr gage, impersonal standards suited to the conditions of the work can be established.

In operation, the gage is generally held vertically by means of the knurled handle. The lever is then squeezed, closing the two clamping surfaces, which are of rounded chisel shape. The specimen then hangs suspended, and the actual amount of burr shows on the dial in direct readings of one-half thousandths. Quarter thousandths are readily estimated. **T-5-47**

Chain-Drive Tapper

The Charles L. Jarvis Company, Middletown, Conn., announces a Jarvis Multi-Tapper for multiple tapping and drilling in mass production lines. Exhibited at the ASTE Show in Philadelphia, this tapper features a silent roller chain to transmit power from the Torquomatic drive unit—a chain that withstands constant friction and which is said to absorb the tremendous shock loads due to continuous forward and reverse action.

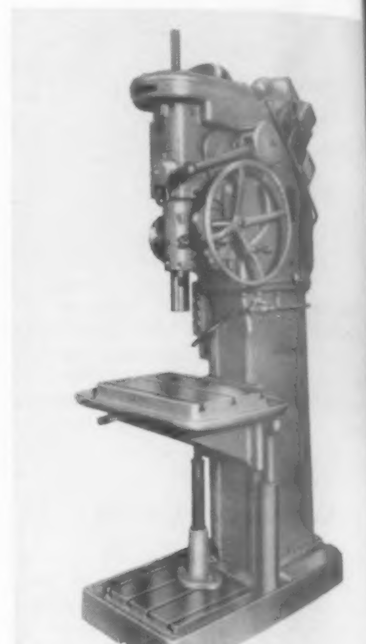




Less wear of gears, quiet operation and increased production at lower cost is claimed by the manufacturer. The number of spindles is limited only by size of tap or drill and the work. Coupled with the performance of the torque-driven Torqomatic, it is said that this Jarvis Multi-Tapper offers unusual production economies. Fully described in company literature, available on request. **T-5-48**

Drilling & Tapping Machine

Barnes Drill Co., 870 Chestnut St., Rockford, Ill., announces the No. 201-4 Barnes Drilling and Tapping Machine. Essentially a high production tool, it is available in single spindle style, as shown, or as a gang drill. Capacity is 1¼ in. in mild steel.



A single lever controls speed changes and a single dial operates feed changes. Automatic depth control trips out feed at predetermined position, for drilling operations, or trips electric reverse for tapping operations. Tapping can be done with thread leading attachment, or taps may be manually started by pressure on the hand wheel.

Swing of the machine is 20 in., max. distance, spindle to table, 33½ in. Spindle regularly fitted to No. 4 Morse taper. Complete specifications may be had from the manufacturer. T-5-49

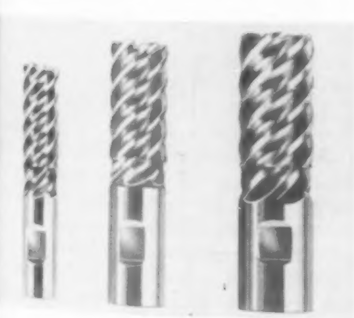
Pressure Block Gages

In order to measure the rolling pressures on continuous strip mills, Pratt & Whitney, Division of Niles-Bement-Pond Company, West Hartford 1, Conn., announces the P&W Electrolimit Pressure Block Gage, designed to be mounted on the mill housing between the top bearing and the screw, or between the bottom bearing and the housing. Two gages are required for each mill stand, one on the drive side and the other on the operating side.

The gages are pre-tested on a testing machine, such as that at the Bureau of Standards, and may be installed as received without further calibration. This pre-calibration permits them to be moved from one mill to another. The pressure measurement is obtained by accurately measuring the compression of a ring, and this measurement is converted to pounds pressure through the medium of the testing machine. A temperature compensator, incorporated in this gage, maintains accurate readings over a wide temperature range. Available in capacities ranging from ,000 to 3,000,000 pounds. T-5-50

Shearcutting End Mills

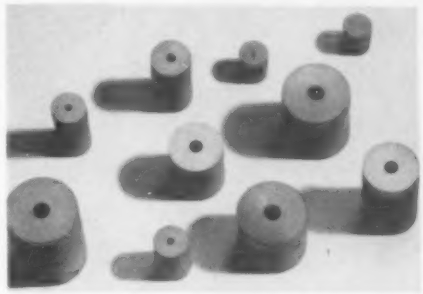
Shearcut Tool Co., P.O. Box 746, Reseda, Calif., has applied the "shear cut" principle to end milling operations with stated results of increased speeds, feeds and depth of cut as compared to conventional end mills. Also claimed is a superior surface finish due to the shearcutting action.



The helical cutting angle of these tools, which are made from high speed steel and ground from the solid after hardening, is unusually large compared to axis of rotation; as a result, chatter and creeping is reduced and tool life considerably extended. T-5-51

Header Die Nibs

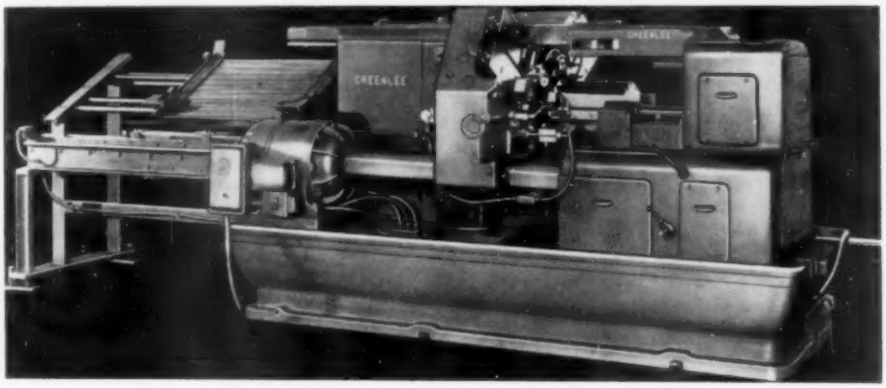
As a result of general acceptance, by industry, of cemented carbide for



header die nibs for heading bolts, screws and similar products, Carboloy Company of Detroit, Mich., now includes Die Nibs in rough cored form among standard stock items. Such stocking provides faster deliveries.

The standard die header nibs are currently available from Carboloy Company in 17 sizes ranging from 9/16 in. O.D., ¾ in. long with cored hole 0.060 in., up to 1¼ x 2⅛ in. with cored hole 0.330 in. The seven smaller sizes are stocked Carboloy grade 55B; the larger 10 sizes in grade 190. A leaflet on the assembly, finishing and maintenance of these die nibs may be had on request. T-5-52

Automatic Shaft Turning Machine



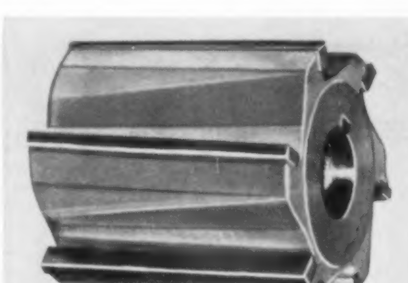
A 6-spindle Screw Machine, by Greenlee Brothers & Co., Rockford, Ill., has been adapted to handle pre-cut bar and tubular stock in lengths 30 to 60 inches. The machine, which incorporates the novel provision of a turning operation on the back end of the stock, thereby eliminating a second operation, is of 1⅝ in. capacity.

The stock is loaded into a magazine at the rear of the machine. This magazine is adjustable for stock of various lengths, and holds up to 40 bars of ¾ in. diameter material. An air cylinder, operating a loading bar, advances the stock into the spindles, where it is accurately positioned by a swing-type stock stop that is automatically cleared from the tooling area after the loading cycle is completed.

At the same time that the new bar is loaded into the spindle, the completed piece is moved forward into a live-roll mechanism which propels it through a sleeve in the gear box and out through the front of the machine. An out-feed hopper—not shown—neatly stacks the bars and makes them readily available for further processing. T-5-53

Carbide-Tipped Slab Mills

The Nelco Tool Co., Manchester, Conn., has added standard carbide-tipped Slab Mills to its line of carbide-tipped milling centers. Manufactured in a wide range of sizes, these tools are currently available in Series 300 for use on cast iron, brass and bronze, and Series 400 for aluminum, magnesium and similar metals. They are not, as yet, recommended for slab milling of steel.



All cutters are of spiral tooth design and incorporate such standard Nelco features as slash milled carbide tip seats and nickel shim brazing. The carbide tips protrude beyond the alloy steel body, thus, it is not necessary to grind steel when regrinding the cutter.

It is claimed that, when properly applied, these slab mills will perform operations usually done with a shell or face mill, and that they will produce more pieces per grind with less consumption of power. However, Nelco engineers recommend that, for maximum performance, milling machine overarm bearings incorporate ball, needle or roller bearings. T-5-54

Ultra-Hard Carbide Parts

Exhibited at the ASTE Cost Cutting Exposition in Philadelphia by the Carboloy Company, Inc., Detroit 32, Mich., was an extensive display of ultra-hard wear-resistant cemented carbide parts and tool components, many of which are here illustrated.

These include machine marking devices with both raised and depressed markings; bolt and screw head upsetting dies with "built-in" markers; solid carbide lettering stamps and various types of embossing dies—again with both raised and depressed markings.

Characteristic of these items is the high surface finish which, in the case of dies, is imparted to the work. Also, ability to resist shock loads, evidenced by production up to several million parts without appreciable wear. These characteristics, along with advances in manufacturing methods, enables Carboloy to overcome previous limitations and to offer broadening applications in the field of cemented carbide. T-5-55

Postiv-Lok End Mills

An End Mill, said to reduce tool costs as much as 25 percent is announced by Putnam Tool Company, 2981 Charlevoix Ave., Detroit 7, Mich. Called Postiv-Lok, the design eliminates the need for integral tapered shank end mills on large boring mill jobs, profiling and similar heavy duty applications. It is presently available from stock in sizes ranging upward from 1½ in. diameter.

These end mills are used with a special Postiv-Lok end mill holder, also made by Putnam. Locking action of the end mill in the holder is aided by torque of the end mill in operation so that the end mill cannot possibly jar loose and cause damage to work.

Also claimed for these end mills is reduced setup and changeover time because they are lighter and easier to manage than tapered shank end mills. Special Postiv-Lok adapters, available for shell end mills and end mills smaller than 1½ in. diameter, permit a variety of milling operations without removing work to other machines. T-5-56

Time Estimating Slide Rule

A Slide Rule for cost estimating, machine loading and sub-contract pricing is now available from the Wales-Strippit Corporation, 345 Paynee Ave., No. Tonawanda, N. Y. The slide rule makes it possible to quickly figure the time and cost of each part, and complete run on a Wales Fabricator, whether the part is in the engineering, planning or production stage.

Said to be simple to use, the slide rule consists of a movable disk, containing a time scale TT, graduated to indicate minutes, with subdivisions in tenths of minutes. The time scale is free to rotate inside of four other stationary scales which are used to indicate stops, different punches, hole punching and notching operations. T-5-57

North East West South IN INDUSTRY

At a recent stockholders' meeting, William F. McDonald was elected president of **E. F. Houghton & Co.** Mr. McDonald, formerly treasurer of the company, succeeds **Major Aaron E. Carpenter** who resigned from the presidency to assume the chairmanship of the board of directors.

Frank R. Freyler has been promoted to manager of **Allis-Chalmers mid-Atlantic** region to succeed William Arthur who has requested retirement. Mr. Freyler has been associated with Allis-Chalmers for 21 years.

The Rice Pump and Machine Co., formerly a division of **Milwaukee Chaplet & Mfg.,** has recently been established as a separate corporation with **R. D. Houghton** as president and treasurer. Mr. Houghton previously was division manager.

Recent election has made **Otto G. Schwenk** a member of the board of directors of **The Yale & Towne Manufacturing Co.** to succeed the late F. Carroll Taylor. Mr. Schwenk has been serving as vice-president in charge of production.

Claude E. Monlux, vice-president of **The Linde Air Products Co.,** was elected president of the **International Acetylene Assn.** during its recent convention in San Francisco. Other officers elected included **James W. Dunham,** of **National Cylinder Gas Co.,** as vice-president; **E. V. David** of **Air Reduction Sales Co.,** treasurer, and **H. F. Reinhard,** secretary.

This year, **The B. C. Ames Co.** is celebrating its Golden Anniversary indicating 50 years of micrometer dial indicator and gage manufacture. Founded by Bliss Charles Ames, who died in 1948, the company is now operated under the presidency of his son, **Warren Ames.**

Dr. James T. Eaton has been named director of research of **E. F. Houghton & Co.,** in charge of the company's research and control department. Dr. Eaton also recently was elected a member of Houghton's board of directors.

"More Power To America Special," a nine-car train bearing exhibits of General Electric Company's products, processes and techniques, is being launched on a nationwide tour this spring under the managership of C. P. Fisher, Jr., former manager of the company's Apparatus News Bureau.

At the annual meeting of the board of directors of **Roto-Finish Co., C. Heamon Castle** was elected to the position of vice-president. Roto-Finish formerly has been known as The Sturgis Products Co.

To encourage those persons engaged in design and engineering of electrically operated products and accord achievement recognition, **The Gage Publishing Co.** has announced the 12th annual Electrical Manufacturing Product Design Awards Competition. Five cash awards, totaling $2500, are being offered for case-history stories depicting greatest accomplishments in product design and development. Closing date for filing manuscripts is June 30.

All operations of the **Cincinnati Planer Co.** are being moved to the plant of the parent organization, **Giddings & Lewis Machine Tool Co.** at Fond du Lac, Wis., according to recent announcement.

A new building for **Hauser Machine Tool Corp.** has been completed at Manhasset, L. I., N. Y. to house the company's office facilities and provide demonstration show-rooms to permit inspection and actual operation of machinery equipment.

Two recent appointments have made **William B. McFerrin** division executive vice-president and **Robert M. Briney** division vice-president in charge of wrought alloy products at **Haynes Stellite division, Union Carbide and Carbon Corp.** Both men formerly were associated with other metallurgical activities of Union Carbide.

William L. Batt, president of **SKF Industries, Inc.,** has been elected a director of American Standards Association. Formerly chairman of the Sponsors Council on Unification of Screw Threads, Mr. Batt was influential in securing agreement on an international level.

Three executive promotions, announced by **The Carborundum Co.,** include **Ernest R. Baxter** as assistant vice-president; **Frederick W. Bonacker,** general sales manager of the company, and **Fred W. Scott, Jr.,** sales manager of the coated products division. The men formerly held the positions of director of sales and sales administration, sales manager of coated products division and assistant sales manager of the coated products division respectively.

William E. Moody has been named manager of sales engineering at **Bay State Abrasive Products Co.** Mr. Moody formerly held the position of abrasive engineer with the company.

Robert F. Dick has been named administrative assistant to Calmer L. Johnson, vice-president and treasurer of **Illinois Tool Works.** Prior to his appointment, Mr. Dick was vice-president of George Fry & Associates.

Robert F. Dick

Delbert G. Faust

Announcement from the **C. A. Norgren Co.,** Denver, has named **Delbert G. Faust** as chief engineer. For the past several months, Mr. Faust has been engaged in coordinating Norgren engineering operations.

Coming Meetings

May 8-19, British Industries Fair. London and Birmingham, England.

May 29-June 10, Canadian International Trade Fair, Toronto.

June 1-2, Fourth National convention and fifth midwest conference of **American Society for Quality Control,** Milwaukee, Wis.

June 12-15, 37th annual convention, **American Electroplaters' Society** and 4th international conference on electrodeposition, Statler Hotel, Boston.

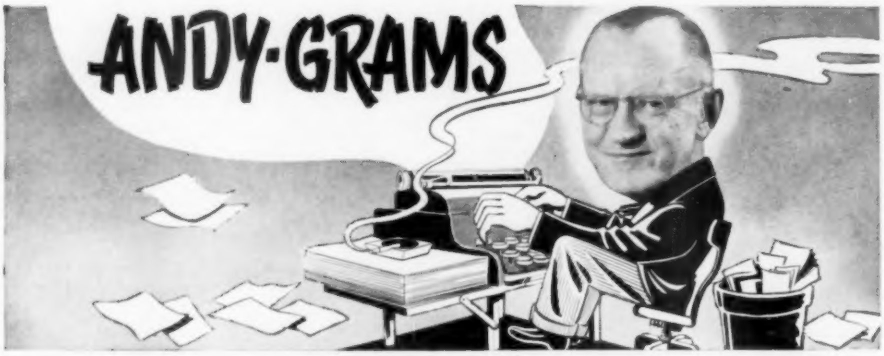
OBITUARY

Alphonse O. Rousseau, abrasive products safety engineer at Norton Co., died recently. Mr. Rousseau, who had been connected with Norton 43 years, also was chairman of the safety committee of the Grinding Wheel Institute.

C. H. Buckmaster, district manager for **Lincoln Electric,** died recently as a result of an automobile accident. Mr. Buckmaster, 43 years of age, had been associated with Lincoln for 20 years.

Dr. Horace W. Gillett, 66, died suddenly while returning from a hunting trip. Dr. Gillett was the former director of **Battelle Memorial Institute.**

George F. Gebhardt, 76, former director of the department of mechanical engineering at **Illinois Institute of Technology,** died recently at his home in Miami, Fla.



At time of writing—April 6—it looks as if the Tool Engineers Cost Cutting Exposition is going to be some Show, wasn't it? But, you'll read all about it in the ASTE News, and maybe I'll add a few informal notes in June issue. Anyway, we're all going to like it, didn't we?

Oh well, the "show must go on," as the troupers say, although at the moment I'm not in the mood for idle chit-chat, being saddened by the passing of Joe Siegel, whom I considered among the closest of my friends in the ASTE. A kindly and forthright man, Joe is firmly enshrined in the hearts of our members, not only as our first president but for his warm friendliness and sterling character. Here's to you, Joe!—and gentlemen, break your glasses.

Besides Joe, Bob Lippard is another of our past-presidents recently gone west; with the dynamic Ford Lamb, the third to go the way of all flesh. Also among the lately deceased is Len Kiefel, a hard worker in Detroit Chapter and a prime favorite among the members of No. 1. Nor shall *auld acquaintance be forgot.*

Thanks to Wm. (Bill) Sjöstedt, who sent in letters and pics, we can now enjoy a more intimate acquaintanceship with members-at-large from "down under" and "up over," wherever the latter Valhalla may be. Since I suspect that Doris Pratt will run the story in an early issue, however, I'll merely make passing comment here so that the boys mentioned will know that the story hasn't been pigeonholed. If anyone has been left out, they'd better send in a letter and pic so as to be included when the story breaks.

Outside of Bill, who is chief tool designer with Scania-Vabis, just outside of Stockholm, ASTEers in Sweden include Nils Goodrich, öland, Eric Larsson, prex of Albin Motors, and Gus Almkvist, temporarily resigned. Gus sends regards to Pete Horn, Earl Ruggles and other old timers going back to '32. Ivar Eklund, also with Scania-Vabis, is a past member who should come back into the fold. How about it, Ek?

In Turkey, we have Feridun Civelekoglu; in India, Ralph Jenks, A. Krishnaswami and H. C. Hagabushana; in China, Nai Lung Chen, and in Czechoslovakia, Josef J. Kohecky, who expresses the sentiments of most ASTEers in hoping for a closer bond between the world's tool engineers—or, as he terms it, technicians.

In South Africa, we have P. J. Van Vuuren and Andy Petican—a happy looking guy—and in South America Gene Lahr, a right guy with whom I had the pleasure of breaking bread at one of our recent ASTE Shows. In England, Alfred Worcester, Fred Garner and Paul Grodzinski, with who I've had some correspondence about my late grandfather.

Down under—Australia, that is—we have Fred H. Hercus, Francis I. Down, and John and Jack Finlay—probably Sr. and Jr. (Got any spare kangaroos or teddy bears?) There must be a lot more, and we'd like to hear from them; for now, however, the heartiest greetings to these members-at-large wherever they may be.

Not long ago, I asked Dr. Ray Nauth to give a talk before a smaller group of which I'm a member. That was the third invite by the same group, indicating that Doc—now Director of Education at the Radio, Television and Electronics School, Detroit—can be heard several times with sustained interest. (A tip to chapters looking for a really interesting speaker).

Doc, who has turned over his Hi-Rockwell interests to Champion Tool Co., was formerly court psychiatrist for an eastern police department and knows all the facts of life. In addition, he's quite an inventor, having specialized in the field in which he is now teaching. Anyway, his talk on electronics held our interest from start to finish, which was close to midnight.

"Doc," I asked during the question period, "is electronics and kindred developments, like radio and TV essentially a young man's game, as we are led to believe?" The answer was a definite "no." "It's true," he conceded, "that men like Marconi and De Forest were young men when they first began playing with wireless, but even they built on the findings of older men—Roentgen for one. However, practically all progress in these fields has been made by older men who, starting young, based their major contributions on the experience gathered through the years."

That seems to hold true in most walks of life. With few exceptions—notably Alexander, Caesar and Napoleon — the great military leaders of history have been crowding or past their 60's. The same holds for industry, in which the truly great leaders are well within the alleged retirement bracket. And while one of the world's greatest corporations has recently been headed by young men, these have surrounded themselves with executives among few are below 50.

I interject this thought for the benefit of several correspondents, one of whom—now approaching 60—suspects that the heir-apparent to the presidency is beginning to heft the axe. So what! I can name any number of men who, having been retired, started their own enterprises and now give stiff competition in their fields. And I know of others who stayed retired, but not for long doing nothing. They went West. Moral: Don't rust out; wear out instead and stay bright.

Apropos the foregoing, I hear that past-Prex Walter Wagner has left Ford Motor Company, where he held important executive positions for many years, and has now opened his own consulting service. Well, Walt knows his stuff and I imagine it won't be long before the industrial world beats a path to his door. Congratulations, Walt—and happy landings.

A letter from Andy Clerk, of Cleveland, expressing pleasure at seeing his story in THE TOOL ENGINEER and also expressing contrition because it took up most of the space in my page. I told him that was okay a/c maybe a lot of our readers would like a change. But don't vote me out too soon; as previously intimated, I want to "leave 'em laughing" and I'm saving a few whoppers for the final "30," whenever it comes.

From one thing to another, I see by a technical news letter, issued by the Department of Defense, that by eliminating "whereases" and "now therefores" in Navy contracts, the Bureau of Yards and Docks recently cut a 13-page form to a single page, and further reduced payment and performance bonds from six pages to one. Imagine that, now! Now, my heartiest congrats to the guy who thought of it and more of the same to the brass that accepted the idea. (Were they tool engineers?) Now, if some bright boy would only think of simplifying the income tax forms!

Reminds me of the time when, along with several lawyers, I was put on a committee to streamline a report. After listening several hours to involved legal phraseology, the while doodling on a pad, I asked: "Now look, can't we reduce it all to English?" So I wrote out my version in simple terms and, believe it or not, even the lawyers understood it. And that's all for now; I'm readying for the Show.

ASTEely yours

Andy

P. S.: I was right the first time; it was a good show, perhaps not the biggest in attendance but, from majority reports, the best so far from the standpoint of sales volume. In other words, it was a success like all ASTE Tool Shows. As I get it, the next one's in Chicago in 1952, and exhibitors might as well start making reservations now because demand for space is going to be plenty keen. To quote from the song by the late Joe Siegel: "On with the ASTE." Do.

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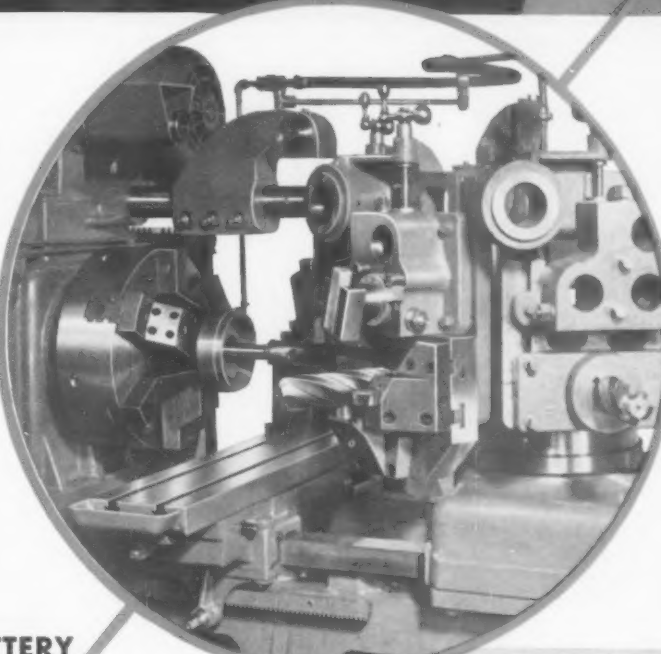

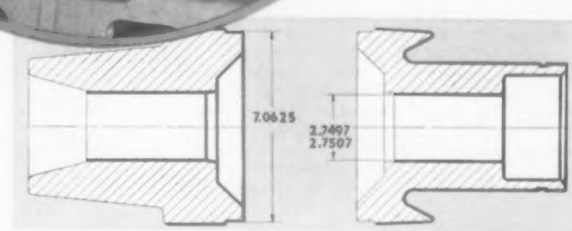

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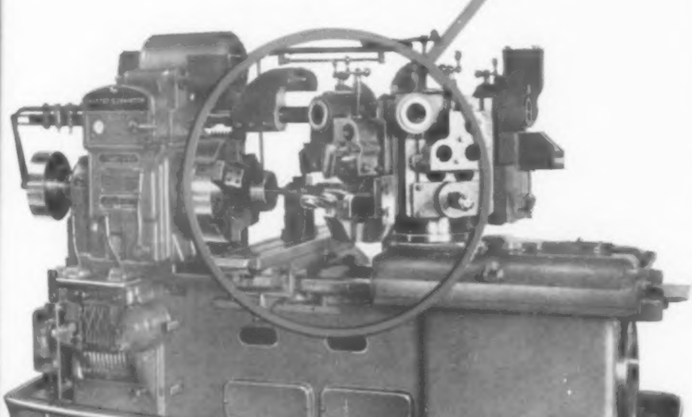

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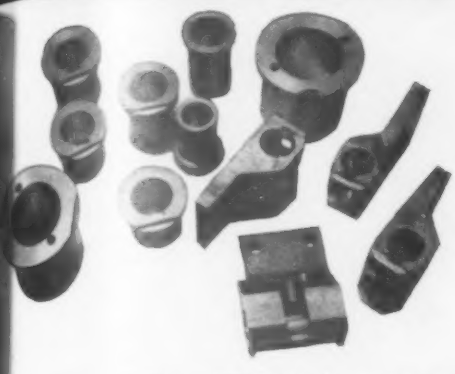

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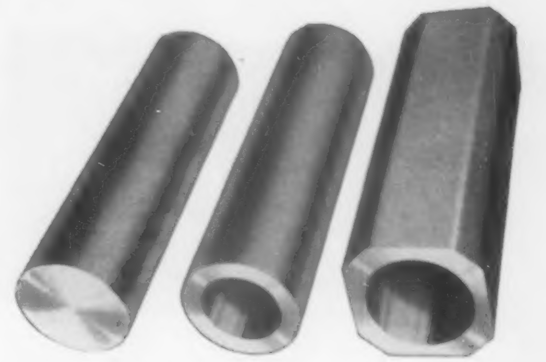

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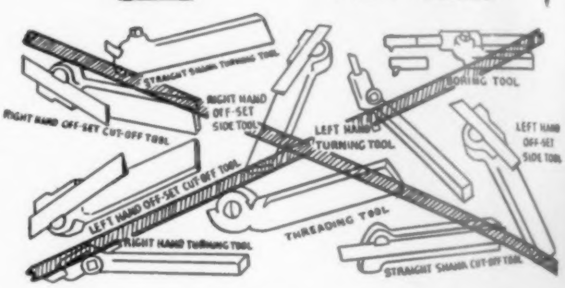

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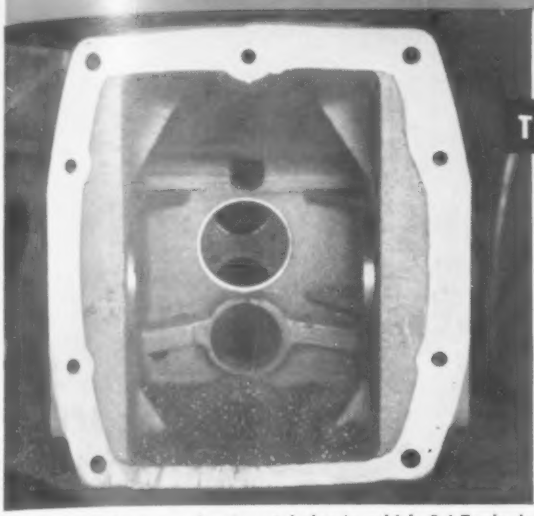
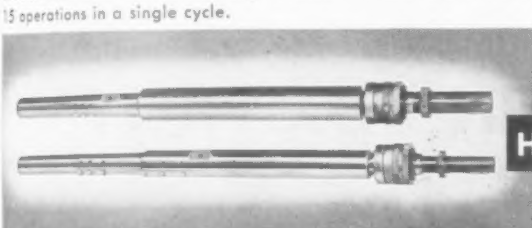


Tractor transmission case showing 4 holes in which S-J Tools do 15 operations in a single cycle.

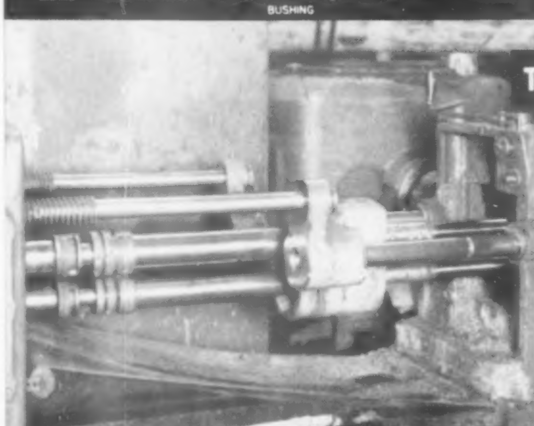
THIS IS THE PROBLEM:

A tractor manufacturer faced this situation when cutting recesses in two holes in a transmission case. After completing boring operations in a W. F. and John Barnes Machine, the case had to be picked up by crane and moved approximately 30 feet to a radial drill press. The shape of the piece made chucking difficult and increased possibilities for error. Loading and unloading was slow for the recessing operations which only took 10 seconds. This tied up a man and a machine, both of which could be freed for other profitable production if the recessing operations could be combined with previous boring operations.



HERE'S HOW IT WAS MET:

Two special bars were designed and manufactured by S-J to do the following operations: Each bar roughs, semi-finishes and finishes 2 bores, and cuts 1 internal recess. One of the bars also counterbores 1 hole as illustrated. The boring operations and recessing operations are now all performed on the case, at one pass of the bars in the W. F. and John Barnes Machine.



Scully-Jones' two combination boring, counterboring and recessing bars in machine.

THE RESULTS:

By combining operations in one machine this tractor manufacturer got these advantages: (1) eliminated one handling operation, (2) freed one man and one machine for other production, (3) increased production, (4) improved accuracy of operations and reduced rejects by omitting one difficult chucking of the piece, and (5) saved tooling and production costs by combining operations on existing equipment.

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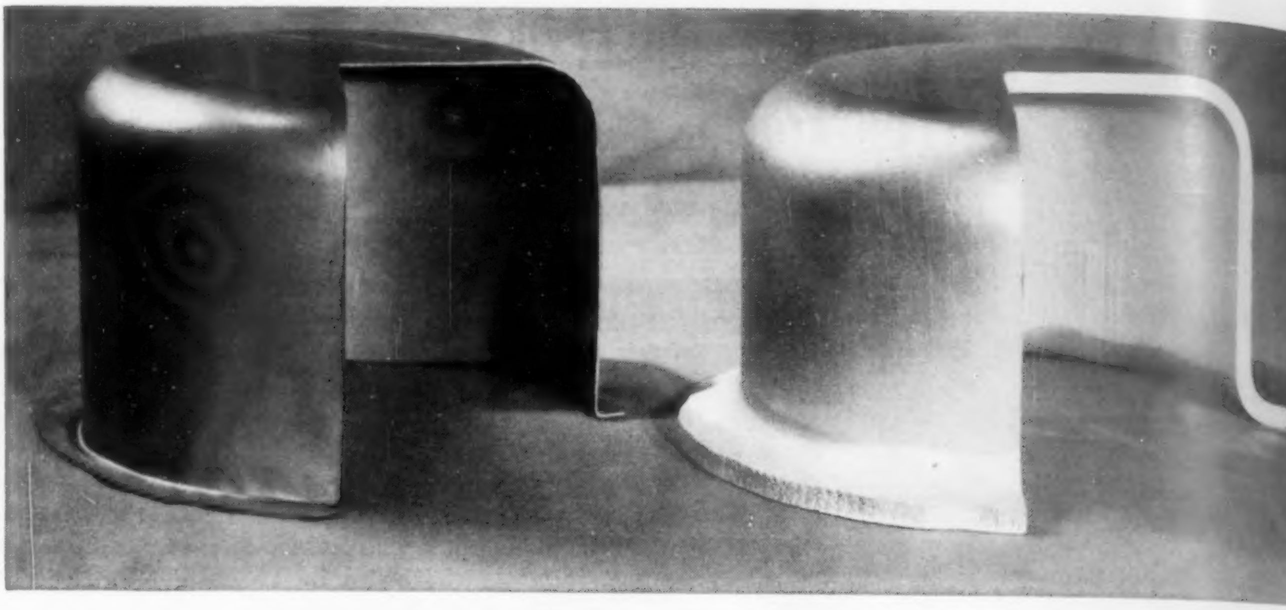

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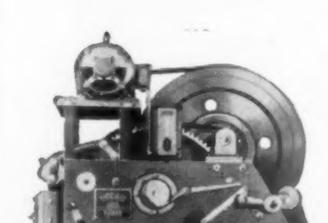

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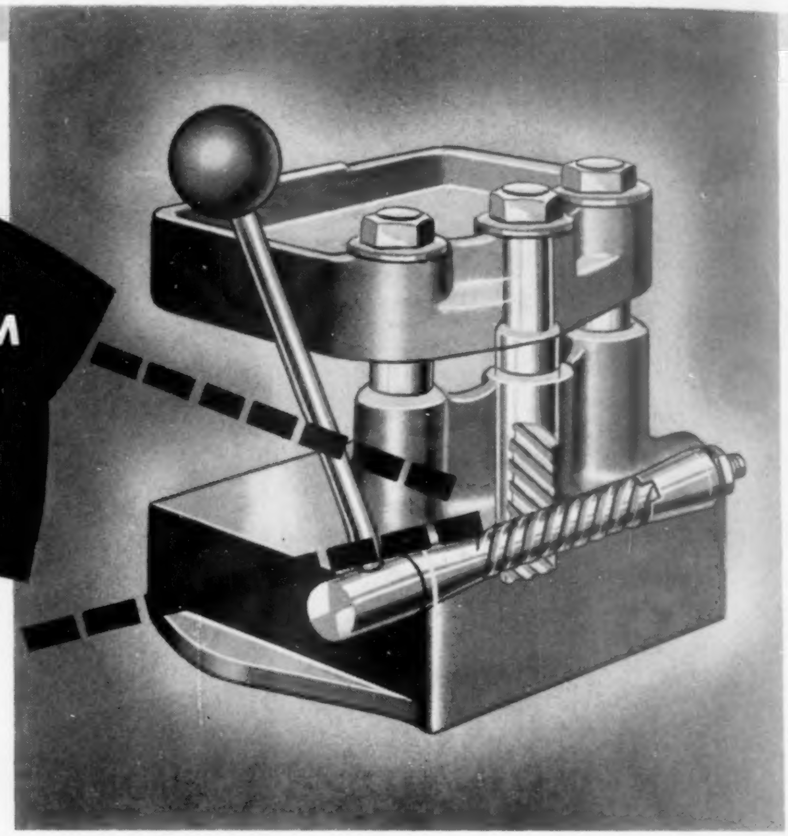

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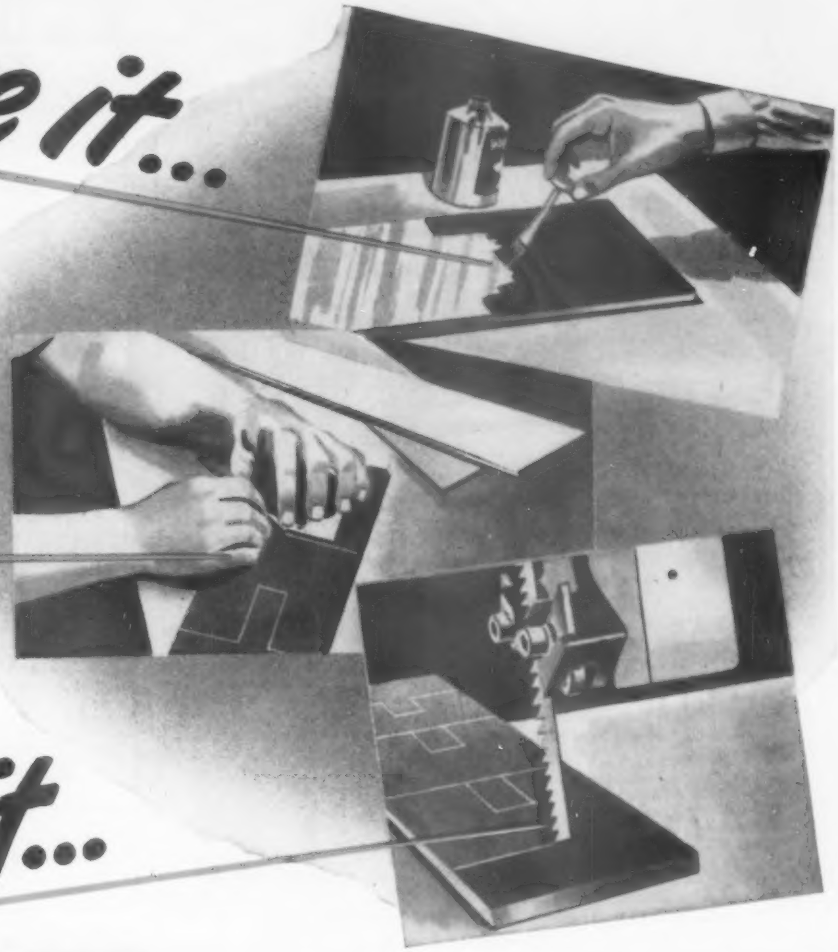

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This Baush 2-Way Heavy Duty Horizontal Hydraulic W-8 Type Multi-Spindle Drill has double-deck holding fixture to hold one (1) cylinder head in upper deck and one (1) head in lower deck while holes are being machined in both top and bottom faces. 90 spindles complete 3220 operations on 35 cylinder heads every hour at 100% efficiency.

UPPER STATION:

Drills —
- 12 Push Rod holes ½ way thru
- 12 Valve Guide holes thru
- 12 Stud holes ½ way thru

Counter bores —
- 3 Intake Valve seats
- 3 Exhaust Valve seats

Core Drills — 2 outer clean-out holes

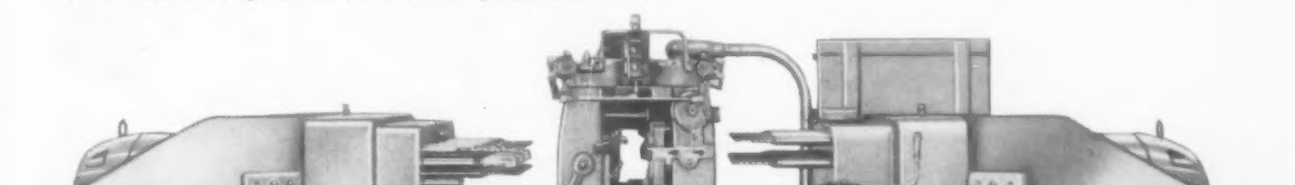
LOWER STATION:

Drills —
- 12 Stud holes thru (to meet)
- 12 Push Rod holes thru (to meet)

Counter bores —
- 3 Intake Valve seats
- 3 Exhaust Valve seats
- 12 Valve Spring Washer seats

Core Drills — 2 center clean-out holes
Reams — 2 outer clean-out holes

MACHINE SPECIFICATIONS: W-8 Type horizontal end sections with hardened and ground steel ways . . . Individual hydraulic pumps & cylinders — 18" max. stroke . . . LH fixed center head — 40 spindles . . . RH fixed center head — 50 spindles . . . 2-40 HP spindle drive motors.



NOTE: An air operated elevator, not shown in this photo, is provided for upper and lower position loading of cylinder heads into fixture

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

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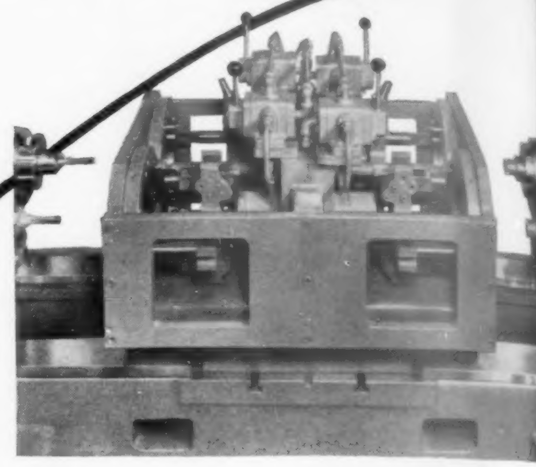
Accuracy!

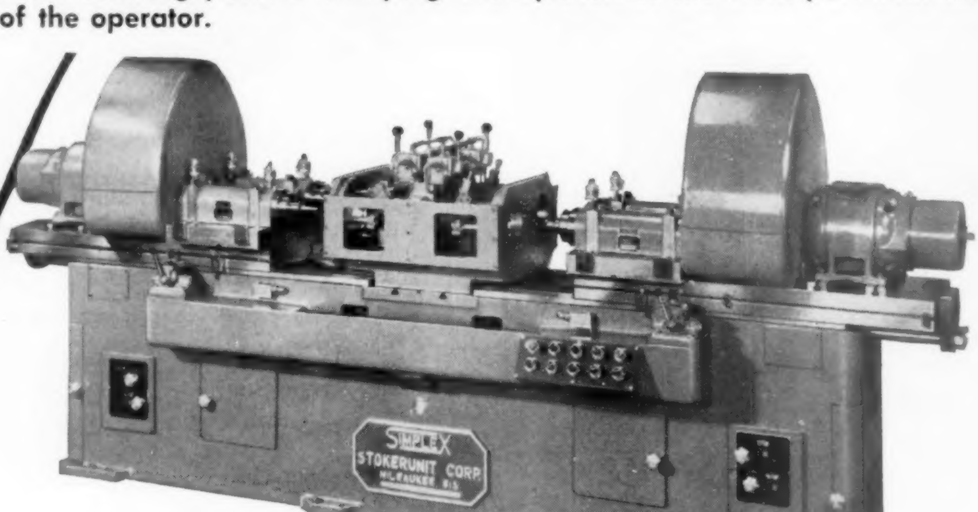
Finish!

Minimum Set Up Time!

SIMPLEX



The finish precision boring of the bearings in production lots of various sizes of end shields for a large electrical motor manufacturer demanded a machine and tooling that would deliver maximum accuracy and finish and could be changed over with a minimum down time. A SIMPLEX #2U 2-Way Precision Boring Machine equipped with four #2 SIMPLEX Precision Boring Heads and a multiple part work-holding fixture met this demand. The accompanying pictures show the machine and also the tooling furnished. The work-holding fixture featured hydraulic actuation of the clamp bars assuring positive clamping and ejection of the work part with minimum effort of the operator.



PRECISION BORING MACHINES

SIMPLEX MACHINE TOOLS DIVISION

STOKERUNIT CORPORATION

4528 West Mitchell Street

MILWAUKEE, WISCONSIN

Precision Boring Machines, Planer Type Milling Machines, Special Machine Tools

More Pieces per Wheel Set-up with

ALOXITE TP

POLISHING GRAIN SERIES

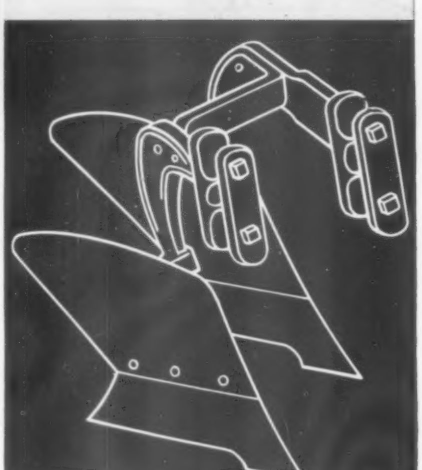
SHAPES AND TYPES FOR EVERY REQUIREMENT

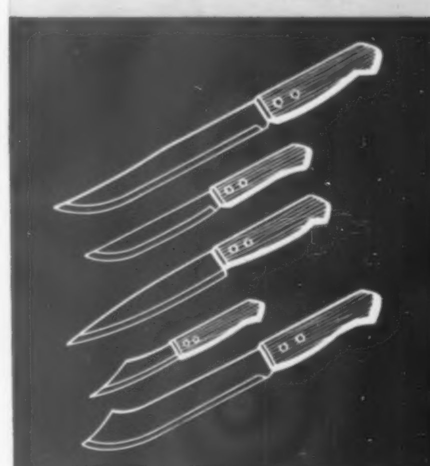
ALOXITE TPT
BLOCKY SUPER-TOUGH
HEAVY DUTY
for maximum stock removal

ALOXITE TP
ANGULAR TOUGH
SHARP
for medium to heavy service

ALOXITE TPC
ANGULAR MEDIUM TOUGH
SHARP
for light to medium service

ALOXITE TPL
VERY ANGULAR
EXTREMELY SHARP
FRIABLE
for stainless steel and
non-ferrous metals





The series of ALOXITE TP aluminum oxide grain by CARBORUNDUM is uniform, dependable, properly shaped, and surface-treated. They give efficient polishing performance on every job from cutlery and surgical instruments to heavy agricultural equipment. For further information on how they help increase production and cut costs, write for new booklet "Abrasive Grain and Powders by CARBORUNDUM". Bonded Products and Abrasive Grain Division, The Carborundum Company, Niagara Falls, New York.

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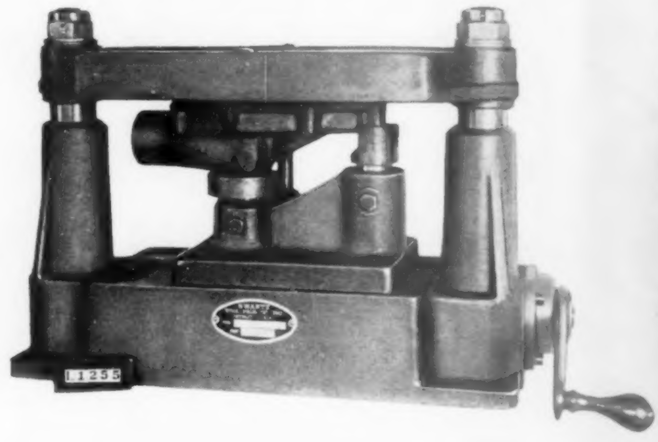
WRITE FOR CATALOG 941

SWARTZ LL-APPLICATION



Drilling all holes in joint face of water pump body. Clamping pushing plate squares up joint face.

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave. **Telephone WE 3-1522** **Detroit, Michigan**

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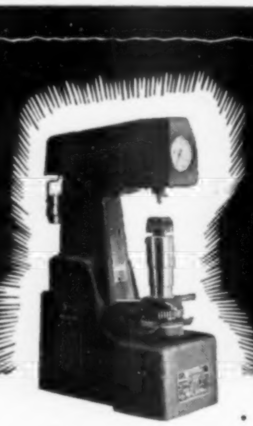

"ROCKWELL" *Superficial* HARDNESS TESTER

. . . with many uses, but only one standard of precision

• For research, supervision or control—in laboratory, toolroom or production line—tests made by the "ROCKWELL" Superficial are as representative of hardness as those made on the regular "ROCKWELL" Hardness Tester. Only requirement is that, since depth of indentation is only .005" or less, surfaces must be smooth and materials homogeneous for general testing.

This instrument is especially suitable for testing very thin material, nitrided or lightly carburized steel and areas too small for regular "ROCKWELL" Hardness Tests. A Wilson Field Service Engineer will be glad to discuss with you whether or not a "ROCKWELL" Superficial Hardness Tester will best serve your needs.

WILSON ACCO
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

230-H Park Avenue, New York 17, N. Y.

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Faster SPINDLE ALIGNMENT

ON tapping and reaming jobs, the Ziegler Floating Tool Holder speeds the making of set-ups because it automatically compensates for alignment inaccuracies, even though they amount to as much as 1/32" radius or 1/16" diameter.

This is why it is so extensively used in shops which keep detailed records of everything that seriously affects production costs. It converts costly set-up time into profitable production time.

The man-hours a Ziegler Holder saves will pay for it several times over in a short time.

W. M. ZIEGLER TOOL COMPANY

13570 AUBURN DETROIT 23, MICH.

Ziegler ROLLER DRIVE **FLOATING HOLDER** *for* **Taps** *and* **Reamers...**

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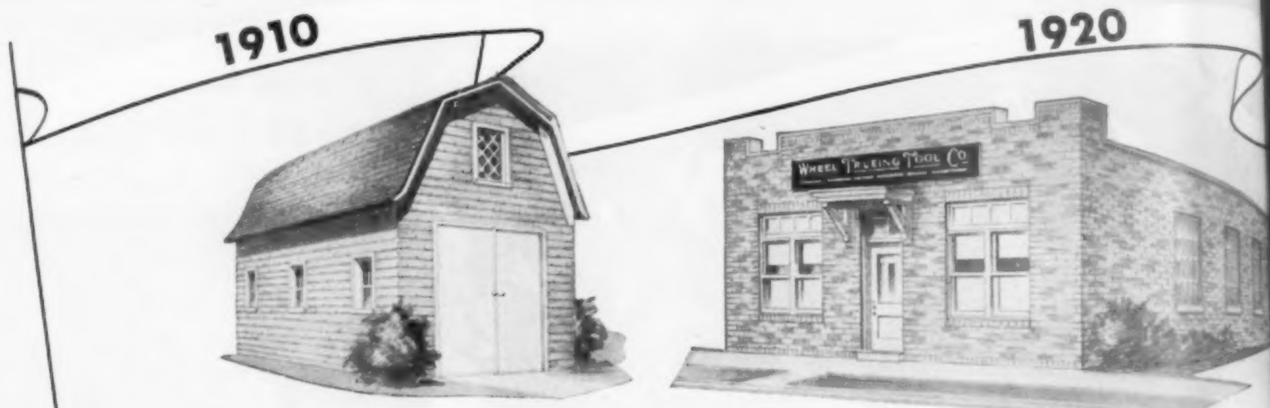
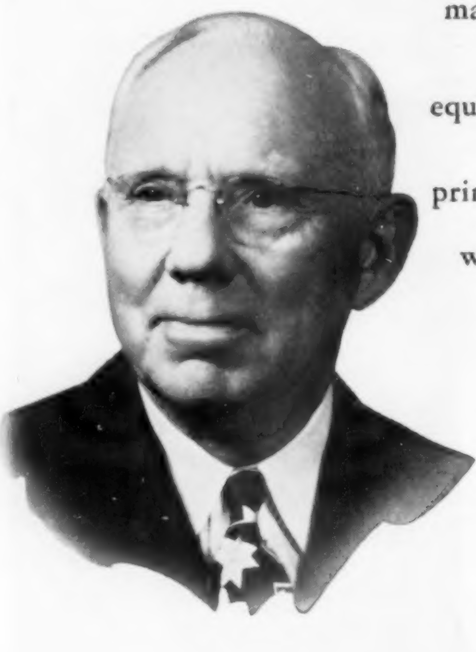


Our First Forty Years..

We are celebrating our Fortieth Anniversary this year with some pride of accomplishment and with a good deal of gratitude to the people who have made this possible.

These include our thousands of friends throughout North America and beyond who have bought our diamonds and diamond products; our many suppliers whose cooperation is so essential, and our company "family" of workers in our several plants and field offices who make, distribute, and service our products.



We have seen this family grow from our original group of three beginners to an organization of nearly two hundred including many outstanding specialists. And, with them, we have graduated through the years from an unheated garage (with practically no equipment) to the most modern of plants and the finest of equipment, much of it exclusive.

Together, we have seen the diamond tool changed from a primitive, handy-man product to a thoroughly scientific tool "engineered to the job" in accordance with the principle which we pioneered forty years ago and developed into recognition throughout industry.

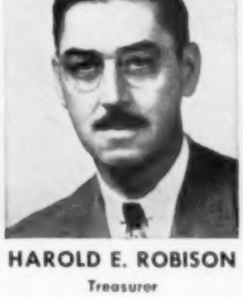
To all of these friends—customers, suppliers, co-workers—our sincere thanks.

WHEEL TRUEING TOOL COMPANY

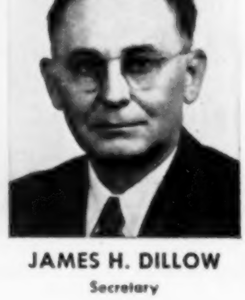
Harvey B. Wallace

President

ERT S. FOWLER
rst Vice President



HAROLD E. ROBISON
Treasurer



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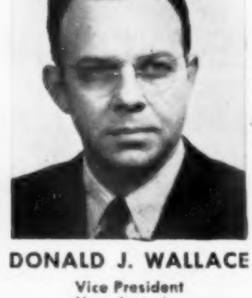
Secretary



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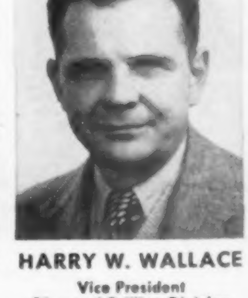
Vice President
Manufacturing



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Wheel Trueing Plant in Windsor, Ontario

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Established 1910

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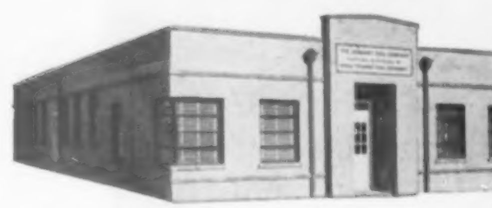
Windsor, Ontario, Canada

THE ADAMANT TOOL COMPANY
(Eastern Division of the Wheel Trueing Tool Co.)
33 West Street, Bloomfield, N. J.



The Adamant Tool Co., Eastern Division: Wheel Trueing Tool Co., Bloomfield, N. J.

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The Fellows No. 36 Gear Shaper installed for cutting production-run quantities of speed reduction and reverse gears at Snow and Nabstedt Gear Corp., New Haven, Conn.

The massive rigidity of this big No. 36 Gear Shaper opens up broad avenues of time saving in the cutting of heavy-duty precision gears with helical, spur or herringbone teeth . . . Power to hog out stock and precision to hold finish cuts to "tenths" . . . Speed and feed changes made in seconds . . . Well worth investigating! Complete literature on request.

ROUGHING AND PRE-SHAVING PERFORMANCE

at Snow & Nabstedt Gear Corp., New Haven, Conn. — manufacturers of S-N Marine Reverse and Reduction Gears.

•

WORK: 57-tooth Herringbone Gear, 14.250 inches P.D. . . . and 25-tooth Mating Pinion, 6.250 inches P.D. (both SAE 8620 steel)

TOOTH CHARACTERISTICS:

Diametral Pitch	4/5
Pressure Angle	20 degrees
Helix Angle	23 degrees
Face Width	3.375 inches
Whole Tooth Depth	.475 inches

GEAR SHAPER SETTING:

Strokes per minute	86
Feed per stroke	.0225 inches

ROUGHING TIME:

(Material Normalized Prior to Cutting)

Gear (in one cut)	26.5 minutes
Pinion (in one cut)	13.5 minutes

PRE-SHAVING:

(After Carburization)

Gear (in one cut)	23.5 minutes
Pinion (in one cut)	10.5 minutes

SAME GEARS SHAVED ON FELLOWS SHAVING MACHINES

with minimum stock removal, minimum correction needed.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.

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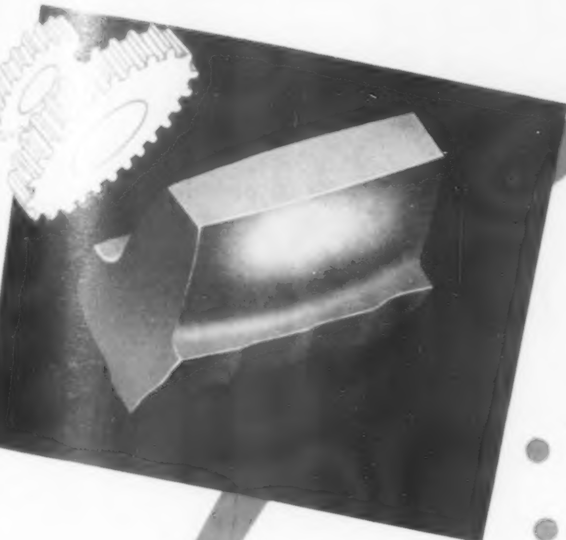
MAY, 1950



Preventing END BEARING OF GEAR TEETH . . .

- increases their factor of safety
- reduces gear noise
- and prolongs service life

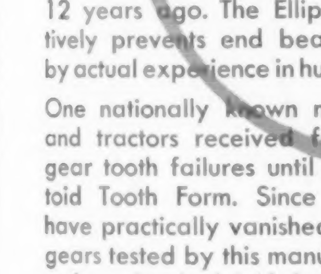
Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

The remedy is the Elliptoid Tooth Form, engineered and produced by Red Ring engineers 12 years ago. The Elliptoid Tooth Form positively prevents end bearing as demonstrated by actual experience in hundreds of applications.

One nationally known manufacturer of trucks and tractors received frequent complaints of gear tooth failures until he adopted the Elliptoid Tooth Form. Since then such complaints have practically vanished. Elliptoid transmission gears tested by this manufacturer for 125 hours under a load of 140 foot pounds and then for an additional 125 hours at 180 foot pounds showed no harmful effects.

Another top ranking tractor manufacturer says the service life of his Elliptoid gears is 30 times greater than that of previous conventional gears. Elliptoid gears are produced on Red Ring Gear Shaving Machines.

Send for descriptive literature.



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and the
DoALL BUTT WELDER
MODEL DBW-10
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This combination can't be beat for quality and performance on all basic sawing operations.
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Model Z-16
Model V-26
Super Zephyr
Model MX-20
Contour-matic
The first band machine tool with complete hydraulic operation
DoALL
BANDSAWS and BLADES for EVERY PURPOSE
DoALL BAND SAWS
Strip-Out METAL BOX
27 KINDS—Band Cutting Tools
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